A
Narrative History

1875
1975

Seattle
Engineering Department

Public Works in Seattle

PUBLIC WORKS IN SEATTLE

A Narrative History
The Engineering Department
1875 – 1975

BY MYRA L. PHELPS

Edited, with additional material and a selection of pictures

BY LESLIE BLANCHARD

with the assistance of James R. Robertson and C. E. Buckner

Written and published under the auspices of

ROY W. MORSE, CITY ENGINEER 1957 – 1971

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Foreword

THIS historical manuscript was started as a means of presenting information in a readily usable form—information that might otherwise never be retrieved from the dust of buried files.

The editors have done their work well. The format chosen by Myra Phelps is logical and easy to follow, and the illustrations with notations added by Leslie Blanchard together with some of his cogent observations, all blend to produce a record that will become of increasing value over the years as scholars and researchers probe its pages.

It is apparent that the first settlers could not have envisioned the great city that would grow on and spill beyond their claims on the shores of Elliott Bay. Nor could they have foreseen the significant landscape surgery needed to mold the townsite for the future safety and economic well-being of its people.

Our forefathers were endowed with amazing vision and fortitude, and it was the early engineers like Benezette Williams and Reginald H. Thomson who translated the problems into effective solutions. Those were great days, and the benefits we share today are largely the result of the major public works they achieved—land reform through regrading, tapping a pure mountain water supply, building a magnificent sanitary and storm water sewer system, and creating parks and beaches, boulevards and thoroughfares—the list goes on.

My time spent in the final editing has given me a rare opportunity to become acquainted with the subject matter in more detail than most readers will. In this process the record has been updated to 1975.

Most difficult has been the section dealing with Freeways. Objective input came from many sources and from several people, including the editors. All agree that the public-private transportation issue, locally and nationally, is complex and the solutions frustratingly difficult. The resulting composite story in Chapter 6 is stated in my words essentially as I see it.

It is a pleasure to acknowledge the cooperation over the years given by many members of the City Council and by former Mayors William F. Devin, Gordon S. Clinton, J. Dorm Braman and Floyd E. Miller whose executive and administrative leadership was essential in achieving many public works during the two decades of the 1950s and 1960s while it was my privilege to serve our City with them.

This final manuscript has been reviewed by Ralph W. Finke, James Robertson, and Phillip M. Buswell, and their assistance is gratefully acknowledged.

ROY W. MORSE

Preface

THE compiling of a history of the Seattle Engineering Department had been a matter of special interest to City Engineer Roy W. Morse. His father, W. C. Morse, who had himself been City Engineer during 1927 and 1928, and who later became Superintendent of the Seattle Water Department, had suggested and set in motion the writing of a history of the latter Department in the late 1940s. This was undertaken by Mary McWilliams, a long-time employee of the Water Department, and was published in 1955. Detailed, comprehensive and interestingly written, it continued and enhanced a tradition established years before by the Lighting Department, whose early annual reports had been prefaced by detailed historical resumes, brought up to date year by year. An almost inevitable sequel was a history of public works in Seattle, as accomplished under the aegis of its Engineering Department, and on October 27, 1965, at City Engineer Roy Morse's request, the City Council sanctioned such a project. As the Supervisor of the Department's Secretarial Section, and with a long-standing interest and extensive knowledge of local history, both of which prepared me for the task, I was chosen to do the research and writing. Actual work began early in 1966, and involved intensive and protracted searching through mountains of existing City records, documents, plans, reports and other "filed and forgotten" impedimentia that constitute the raw material of history. After more than two years of work, the manuscript, as originally conceived, reached very nearly its final shape. The back issues of Engineering and Construction magazines, etc., listed in the bibliography have been a major source of pertinent information.

Librarians in the Municipal Branch of the Public Library gave inestimable assistance in suggesting and locating various sources and materials.

Materials from individual divisions of the Department supplemented much information that was available in the Engineering Department files and vault records and was sometimes the chief or only source.

MYRA L. PHELPS

Editor's Preface

THE history of the Seattle Engineering Department already has a history of its own. Between late 1967 and late 1970, the project, for want of anyone else in the department with the time and the inclination to finish it, was consigned to a kind of official limbo—from which it was now and then momentarily resurrected to provide specific data in the interest of settling legal disputes affecting the City.

My involvement with this project began late in 1970, when one of my own publications, "The Street Railway Era in Seattle," came to the attention of some Engineering Department officials, and ultimately to Mr. Morse. The result, to make a long story short, was that I was offered, and accepted, the responsibility of putting the finishing touches to Myra Phelps' original manuscript, and of making a selection of pictures to illustrate and supplement it. The text which follows is the result of this "collaboration."

My own contribution to this history consists primarily of two sections covering topics not treated in the original manuscript: Chapter 9, on Street Lighting, and Chapter 18, dealing with the origin, development and internal affairs of the Engineer's Office. The section on Seattle's Street Railway development in Chapter 10 (Public Utilities) is also my work, as is the briefer resume of early railway developments in Chapter 4 (Seawalls). Aside from these, and a few very minor emendations and additions elsewhere, the book is substantially as its original author left it. Considerable documentary material is primarily my responsibility; and so, as indicated above, is the pictorial selection and captioning. Much of the latter was intended to augment and supplement the material covered in the narrative; some of it, however, particularly in the section on the development of maintenance equipment and the activities of the old Streets and Sewers Department, constitutes a story in itself, whose very nature lends itself much better to picture-caption treatment than to "straight" narration. It is here, perhaps, that the Editor's own interests and predilections have become most evident, as the admittedly sentimental and nostalgic treatment of the older and, in particular, steam-powered rollers and other equipment will attest.

A few scenes not specifically related to the Engineering Department's activities have been added here and there on account of their rarity and antiquarian value; some of these have never appeared in print before. With very few exceptions, all are from the Engineering Department's photo collection, and from the old Streets and Sewers photo collection, now incorporated into it.

My additions to this historical compilation would have been far more meager had I not been able to draw upon the generous assistance and capacious memories of two long-time former employees of the Engineering Department. One of these, Mr. James R. Robertson, whose service with the City began in 1924 with the Engineering Department, and later included two tours of duty as Assistant City Engineer, and one as Acting City Engineer, served in a more or less "official" capacity as adviser to this project; he read both the original manuscript and my additions to it, and suggested many beneficial revisions and additions. Particularly valuable—in fact, practically indispensible—was his knowledge of the internal workings of the Streets and Sewers Department before it became the City Engineering Department's Maintenance Division; to this is largely due whatever merit the rather extensive picture-and-caption treatment of that Department's activities and equipment may possess. Another former employee, Mr. Carl R. Colfelt, whose career with the City spanned the 42 years between 1919 and 1961, supplied an almost inexhaustible wealth of detailed recollections about organization, working conditions and social relations which enabled me to recapture, perhaps as well as anyone who had not actually experienced it, the felt and perceived quality of life in the Department during those years. Much of the detailed description of this aspect of the Department's history, as it appears in Chapter 18 of this book, is due to his contribution; the actual use made of this material, as well as the opinions and evaluations that accompany it are, however, solely my responsibility.

The original manuscript was read by the Messrs. Roy W. Morse, Philip M. Buswell and W. E. P. Smith, and by Mrs. Clarice White, all of whom contributed a number of constructive criticisms, suggestions and additions, the incorporation of which into the finished text subsequently became my responsibility. To Mr. C. E. Buckner, Supervisor of the Survey-Engineering Section, was delegated the responsibility of expert attention to the chapter on Surveying and Mapping.

LESLIE BLANCHARD

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Introduction

SPEAKING of Puget Sound, Captain George Vancouver said, "To describe the beauties of this region will, on some future occasion, be a very grateful task to the pen of a skillful panegyrist. The serenity of the climate, the innumerable pleasing landscapes and the abundant fertility that unassisted nature puts forth, requires only to be enriched by the industry of man to render it the most lovely country that can be imagined, while the labor of the inhabitants would be amply rewarded in the bounties which nature seems ready to bestow on civilization."

Here was an immense protected harbor, a little gently sloping shore land along the beaches, a glacial moraine of sea-bottom sand, shells, plastic clay and gravel left several million years before, innumerable gullies and gulches leading in every direction, many with streams coursing down their ravines; several swampy areas with trees and undergrowth over all. It had been called Puget Sound and had become a port in 1850.

Many and prosperous settlements had been established in the east and south parts of the region; and here in 1850 Dr. David S. Maynard came to investigate the coal deposits on the Stillaguamish River, and in 1852 to start a fishery and trade with the Indians in Seattle.

In 1851 A. A. Denny, Wm. Bell, John Low, Carson D. Boren, and Charles C. Terry and their families established the Alki Point settlement. In 1852 they moved across the bay to the northeast and took claims in what is now the business district of Seattle. The Luther M. Collins family was the first family in King County and they, with Jacob and Eli Maple and Henry Van Asselt, were the first to settle permanently in or near the present City. Their claims were established near the mouth of the Duwamish River.

The people literally lived off the land and the sea, as has been told many times, but how did they "make money"?

At New Market, near Olympia, a grist mill was established in 1847 which got as much as $50 per barrel for its flour. At the same place a saw mill was built which cut 1200 feet per day and got up to $50 per thousand for its lumber. In 1850 the mill was sold for $35,000.

In 1852–53, Henry L. Yesler's saw mill at First and Yesler Way cut 8000 feet of lumber per day which sold in San Francisco for $60 per thousand feet, and from $90 to $100 per thousand feet a year later.

Captain Robert C. Fay operated a salmon packing fishery at Duwamish Head. Dr. Maynard's crew of Indians packed 900 barrels of salmon, which were shipped to San Francisco. The brig "John Davis" loaded a cargo of pilings and squared timbers for San Francisco; they cost six to eight cents per linear foot for the pilings here in Seattle, and 16 cents for the squares. Shingles brought up to $3.00 per thousand.

L. M. Collins advertised in 1852 that his nursery in the Duwamish Valley could provide 200,000 young fruit trees.

A $50 fee licensed shipmasters to vend, sell or retail at private sale any goods, wares and merchandise within the County of King, and all the ships that entered the harbor carried merchandise for trade. Dr. Maynard and C. C. Terry were two who established stores where local produce could be exchanged for imported items on a first come, first served basis. Conditions might have been much more difficult in the 1850s had it not been for the ships bringing merchandise and carrying away cargoes of lumber, timbers, cordwood, piling, salmon, potatoes and cranberries.

A. A. Denny was elected to a vacant seat in the Council of the Oregon Legislature in 1852. Polling places in Thurston (soon to be King) County were at the house of Whitfield Kirtley in Olympia, at the house of J. M. Chapman in Steilacoom, at the house of D. S. Maynard at Dewamps (Seattle), at Dr. Lansdales' on Whidbey Island, and at Plummer and Hastings' Store in Port Townsend. The Territorial Capital had been moved from Oregon City to Salem in May of 1851. Because of slow and irregular mail service, returns of the election did not get to the capital at Salem until in late January and Mr. Denny was not notified of his election until the session was over. The 60-day assembly of the Legislature had been called for December 6, and so Puget Sound had only one representative in the House of Representatives that term. This experience pointed up the fact that the Sound country was not getting the attention it should, and many of the settlers believed that the territory was too large for one political division. Interests were too divergent over its entirety; mail and news traveled too slowly; transportation was too difficult. It took at least three days by canoe to get from Seattle to Olympia, and then only when the weather was fit for travel. Agitation began for a separate territory to be called "Columbia." A memorial* was drafted in November and presented to the Thirty-third Congress on December 6, 1852. On February 8, 1853, a bill recommending the division of the Oregon Territory was presented to the House. Mr. Stanton of Kentucky was credited with suggesting that the name of "Columbia" should be changed to "Washington" to honor the first president. The bill was passed on March 2, 1853. Washington Territory included the present state and parts of Idaho and Montana north of the 46th parallel and west of the crest of the Rocky Mountains.

News of its new status did not reach Washington until April 25, 1853. Only territories with a population of over 5,000 white males were entitled to have their own legislatures, but Washington Territory was permitted to have its own legislature from the beginning, though its white male population did not meet the requirements. The Governor and other important officials were appointed by the President and approved by the Senate.

Mr. J. Patten Anderson, the United States Marshal, was the first to arrive. He immediately took a census of the population of the territory, establishing the fact that King County had a population of 170 white men with 111 of them voters. Total population in the Territory was 3965 white males, 1682 voters.

King County was created December 22, 1852, by an act of the Oregon Legislature, with the seat of government in Seattle. At the same time, Island, Jefferson and Pierce Counties were separated from what was known until that time as Thurston County of the Oregon Territory. On April 4, 1853, King County Commissioners appointed William S. Bell as Supervisor of Road District No. 1 which included all that portion of the county north of the Duwamish River, and George Holt as Supervisor of Road District No. 2 which was all of the portion south of the River. The only way across the River was by ferry; for the privilege of running this ferry L. M. Collins paid a two-dollar license fee annually. The ferry schedule read:

Footman, 12½ cents
Man and horse, 50 cents
Wagon and team, $1.50
Additional horses and oxen, 12½ cents each
Sheep and hogs, 5 cents each

People continued to build their houses on the high spots with foot paths following along the dry places; and in May 1853, three people decided to lay out a town site. A. A. Denny and C. D. Boren platted the first: twelve blocks on the north of Yesler Way, east of Front Street. Dr. Maynard disagreed with them about the base line near the shore from which they began their survey, and so laid off his own townsite of 58 blocks, using as his base line a point about a half-block west from that of the Denny-Boren plat. One plat was laid off with reference to the proper meridian and one in reference to the curve of the bay. This created the half-block jog where the two sets of streets touched Yesler Way and accounts for the off-set between First and Second Avenues and First and Second Avenues South, and left the two triangles of Prefontaine and Fortson Squares when the streets were connected by an easier curve after the fire of 1889. In May 1872 the City Council fixed the grade for the "datum point" at three feet above the stone monument at the center of Yesler Way and First Avenue South, so as to establish the grade seven feet above spring tides. The marker was transferred later to the northwest corner of Washington Street and First Avenue South, but there was no practical way to eliminate the jog at Yesler. The base line for platting has been changed several times during the years and a new system was worked out in the 1960s to insure more accuracy in future city surveying.*

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* Memorial: A statement of facts, often with a petition that something be done, sent to a government. (Often used in Territorial days)

By July 5, 1853, the need for an assessor became apparent and L. V. Wycoff was appointed at a salary of $90 for the year. J. N. Ayers was appointed Treasurer, Jacob Maple and C. C. Terry, Justices of the Peace, and Henry Smith and Charles Doe, Constables. A tax levy of four mills per dollar was made to defray county expenses.

The post office was established and the first mail received in August 1853. Alki got the second post office in the county in 1854. To bring a letter or paper from Olympia to Seattle by canoe cost twenty-five cents.

The town was growing. More lots were platted on the various donation claims. Land was set aside for churches and schools. Stores and saloons were opened; Dr. Maynard began to sell lots from his claim. The people wanted to make their own routes of travel to the East and worked toward opening a road through one of the mountain passes, by-passing Olympia. The town's population of 24 in 1851 increased to 250 in 1860 and 350 in 1865.

On January 18, 1865, the Legislature incorporated the Town of Seattle and appointed a Board of Trustees to serve until the April elections. These Trustees met and organized on January 28, electing C. C. Terry as President of the Board. Of the several ordinances which this body passed, No. 4 pertained to the building of plank sidewalks on both sides of Commercial Street (First Avenue South) from Mill Street (Yesler) to Jackson Street, these walks to be eight feet wide and constructed with crossings, all at the expense of the abutting property owners. In 1865, one H. J. Stevenson was appointed City Surveyor on a temporary basis† and was instructed to survey

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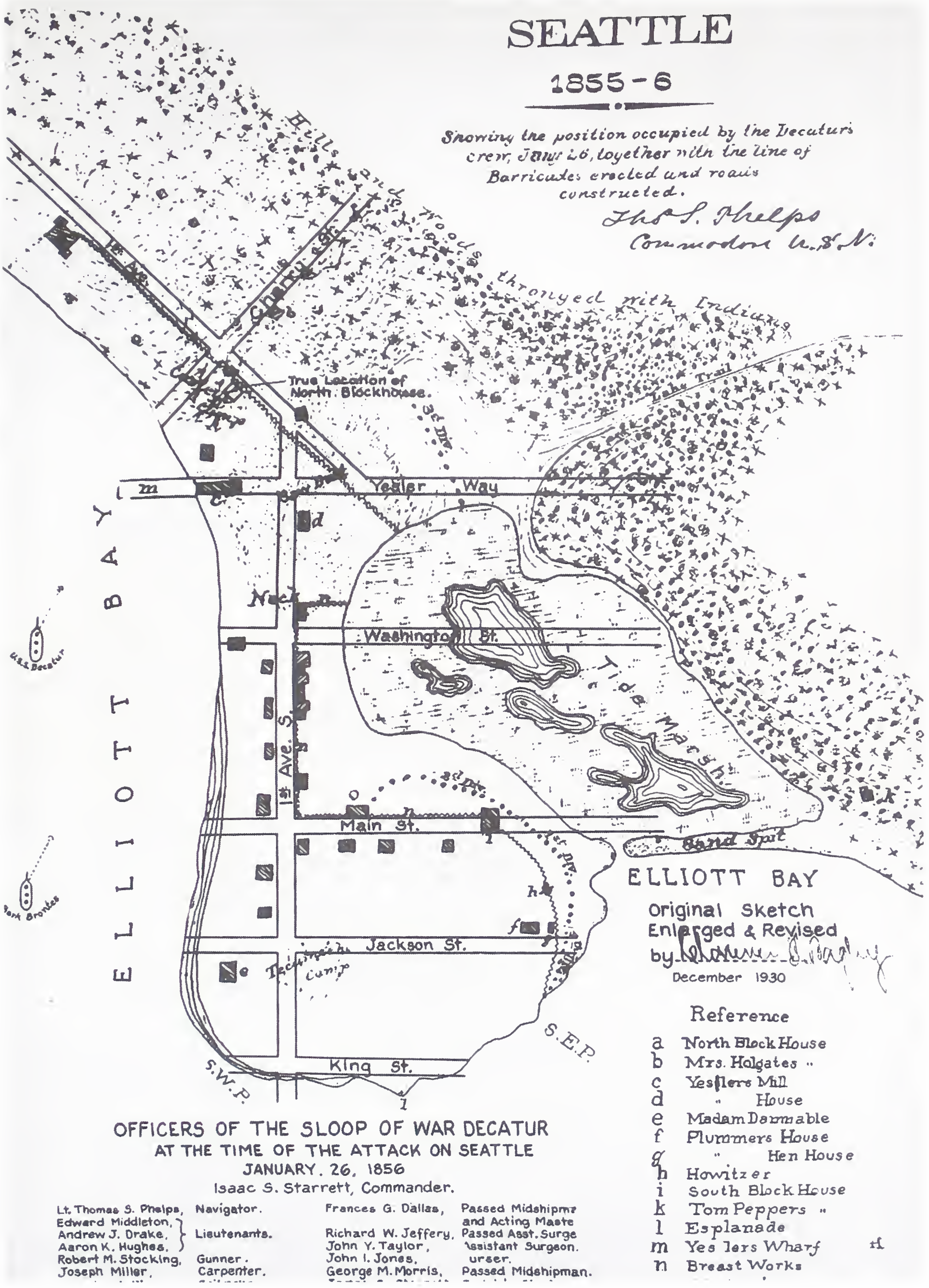
* See Chapter 17 (Surveying) for more detailed discussion.

† See Chapter 18


SEATTLE
1855-6
Showing the position occupied by the Decaturs crew, Jany 26, together with the line of Barricades erected and roads constructed.
Thos S. Phelps
Commodore U.S.N.
Hills and Woods thronged with Indians
Cherry St.
Front St.
True Location of North Blockhouse.
Indian Trail
3d Dr.
Yesler Way
Mill St.
Neck
Washington St.
1st Ave. S.
Tide Marsh
2d Pt.
Main St.
1st Dr.
Sand Spit
Jackson St.
Tecumseh Camp
King St.
S.E.P.
S.W.P.
ELLIOTT BAY
U.S.S. Decatur
Bark Brontes
ELLIOTT BAY
Original Sketch
Enlarged & Revised
by
December 1930
Reference
a North Block House
b Mrs. Holgates "
c Yeslers Mill
d " House
e Madam Damnable
f Plummers House
g " Hen House
h Howitzer
i South Block House
k Tom Peppers "
l Esplanade
m Yeslers Wharf
n Breast Works
OFFICERS OF THE SLOOP OF WAR DECATUR
AT THE TIME OF THE ATTACK ON SEATTLE
JANUARY. 26, 1856
Isaac S. Starrett, Commander.
Lt. Thomas S. Phelps, Navigator.
Edward Middleton, Andrew J. Drake, Aaron K. Hughes, Lieutenants.
Robert M. Stocking, Gunner.
Joseph Miller, Carpenter.
Frances G. Dallas, Passed Midshipma and Acting Maste
Richard W. Jeffery, Passed Asst. Surge
John Y. Taylor, Assistant Surgeon.
John I. Jones, urser.
George M. Morris, Passed Midshipman.

Seattle and Elliott Bay
1855–6

the streets and prepare a uniform grade system. These grades, established by Ordinance on May 20, 1866, appear to have begun the process of doing away with the ups and downs that prevailed where the existing streets had merely followed the contours of the ground. Almost exactly ten years later, on June 8, 1876, came Seattle's first comprehensive regrade, when an ordinance was passed, followed by the letting of a contract, providing for grading First Avenue from Yesler Way to Pike Street, and Yesler Way from Fifth Avenue to Eighth Avenue. The improvements were to be paid for by abutting property owners. One George Edwards had the contracts for both the grading jobs, but Yesler Way slid out when the grading was half completed and work was temporarily abandoned. On First Avenue, quarrels over crib work, earth for filling, overhead passage of Seneca Street, and nonpayment of assessments delayed progress, but the grading was eventually completed. Elsewhere in what is now downtown Seattle a washboard terrain prevailed, with 20 and even 30 per cent street gradients being not at all uncommon.

The Board of Town Trustees had been made ex-officio trustees of schools and the corporate limits of the town were made to form one school district. Voters and office holders had to be citizens, married, householders, tax payers within the city limits on property worth at least $250, and residents of the town for at least ten days prior to the election. Widespread dissatisfaction with these requirements finally coalesced in a movement for disincorporation, and a petition to the Territorial Legislature to that effect was granted in mid-1867. Reversion to the status of a precinct of King County did nothing to solve the settlement's political and financial problems, however; the delinquent taxes still had to be paid, and the population continued to increase. A new Charter of Incorporation was accordingly petitioned for and granted late in 1869. It was considerably more specific concerning assessments, taxes and improvements; the City debt was not to exceed $5,000; a road tax was to be levied; not less than two mills nor more than six mills were to be assessed against every dollar's worth of property, as shown by the returns and assessment rolls. This tax was to be collected and used to improve the streets and roads within the City.*

By 1883, the road and poll tax had dropped to not more than four dollars for every male inhabitant between 21 and 50 years, and the special tax was not more than three mills on every dollar's worth of property within the City. The City's debt limit had climbed to $50,000, exclusive of water and street improvements. In 1885, the Assessor enumerated 9786 inhabitants, and the City debt limit increased another ten thousand dollars.

The first Freeholder's Charter was prepared by a Freeholders' Convention in the summer of 1890. It was the first of several and provided some

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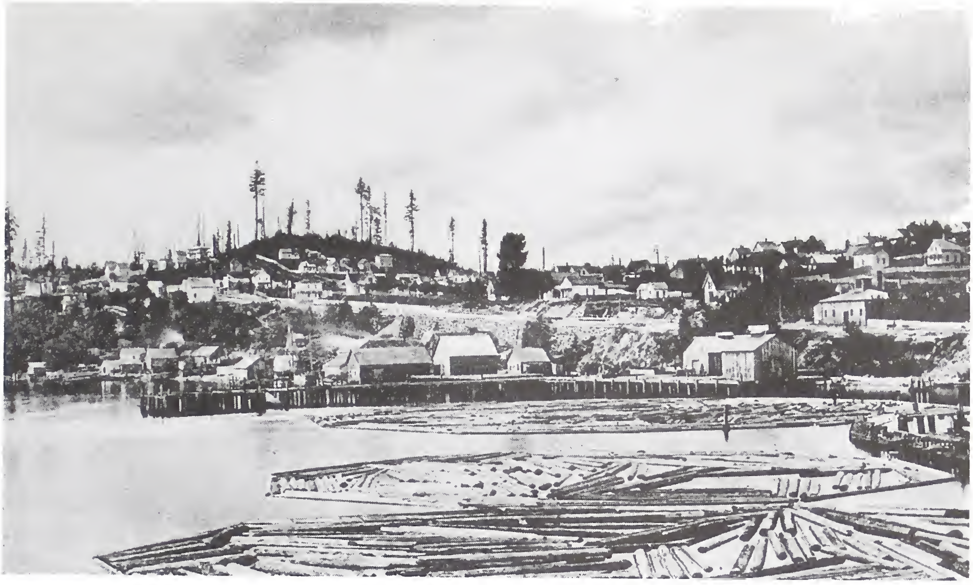
* See Chapter 16 for a more detailed discussion of this episode.



North from Yesler Dock 1878

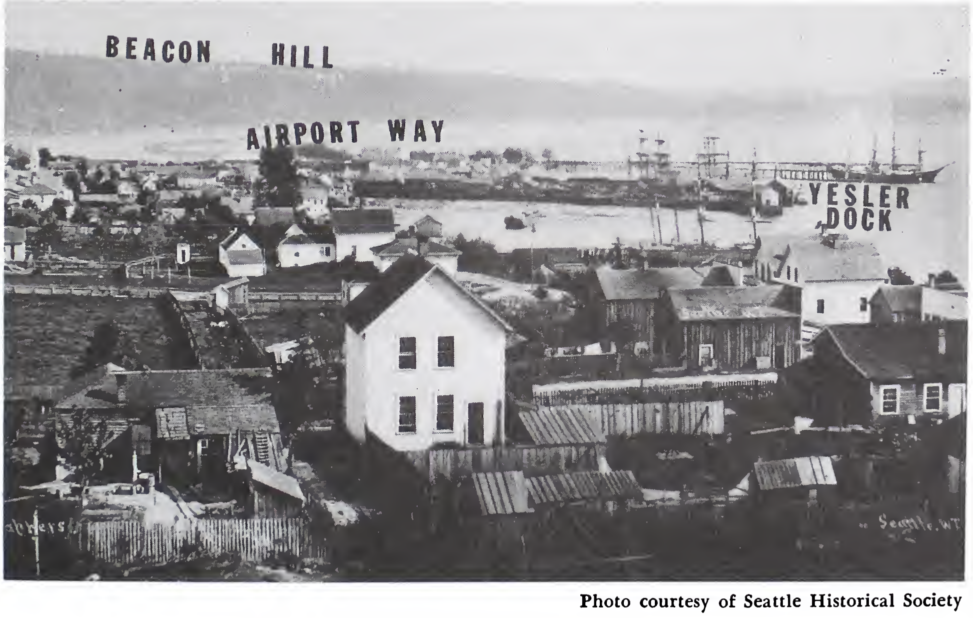
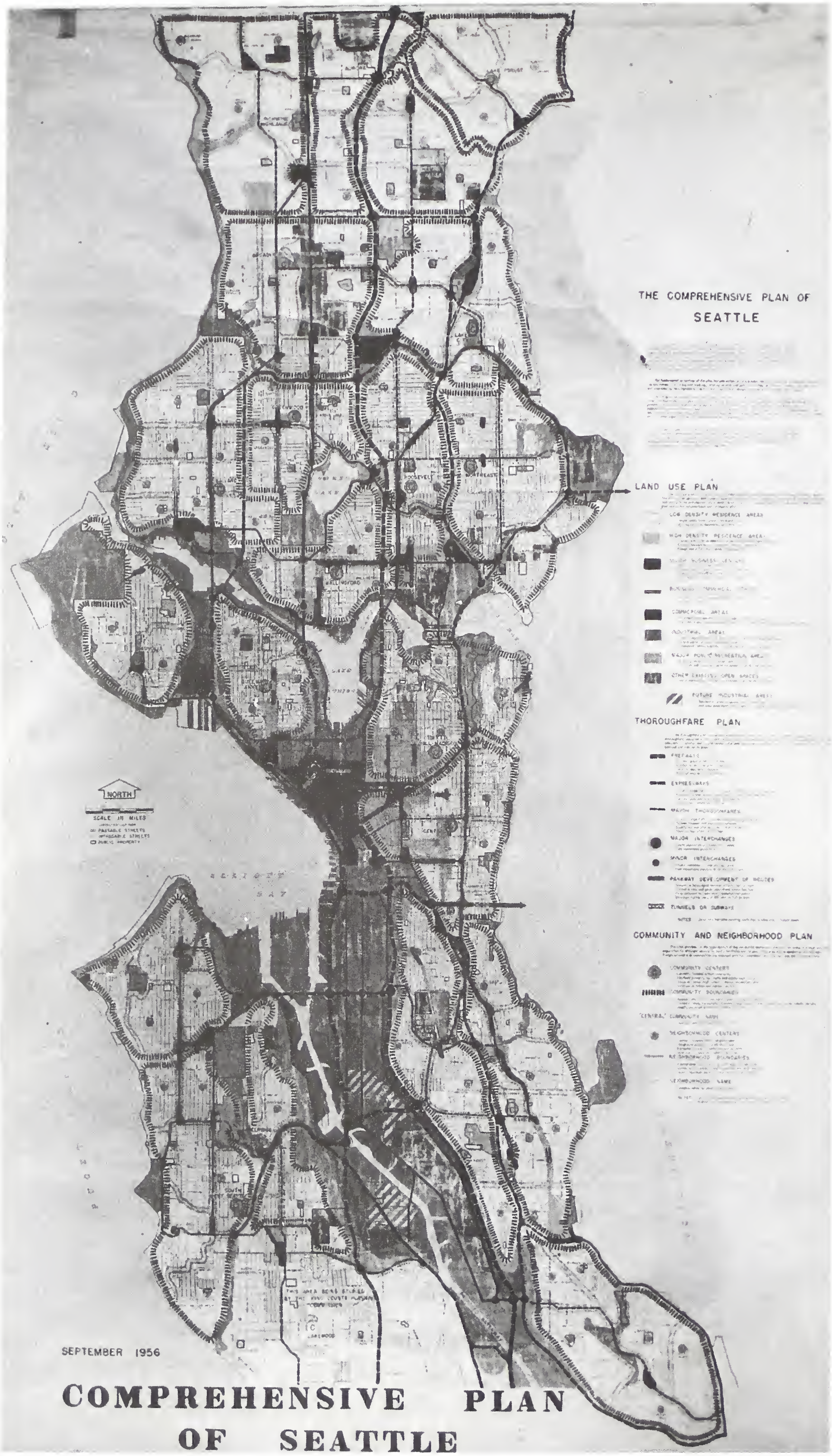


Photo courtesy of Seattle Historical Society

Seattle Waterfront ca. 1880

Reginald H. Thomson City Engineer 1882—Aug. 1886, May 1892—Dec. 1911, Aug. 1930—July 1931 important and major changes, as have subsequent documents instigated by the events that have followed, and by the growth and advance of the area. To substantiate a claim to the status of first class City, the authorized census of that year counted 44,748 people.

Seattle maintained its rapid growth during the next ten years, attaining a population of 80,761 in 1900, and was counted among the rapidly growing larger cities of the country. This growth, together with the irregular terrain which restricted the expansion of an overflowing business district and rising property values, forced the beginning and continuing of many developments and construction projects.



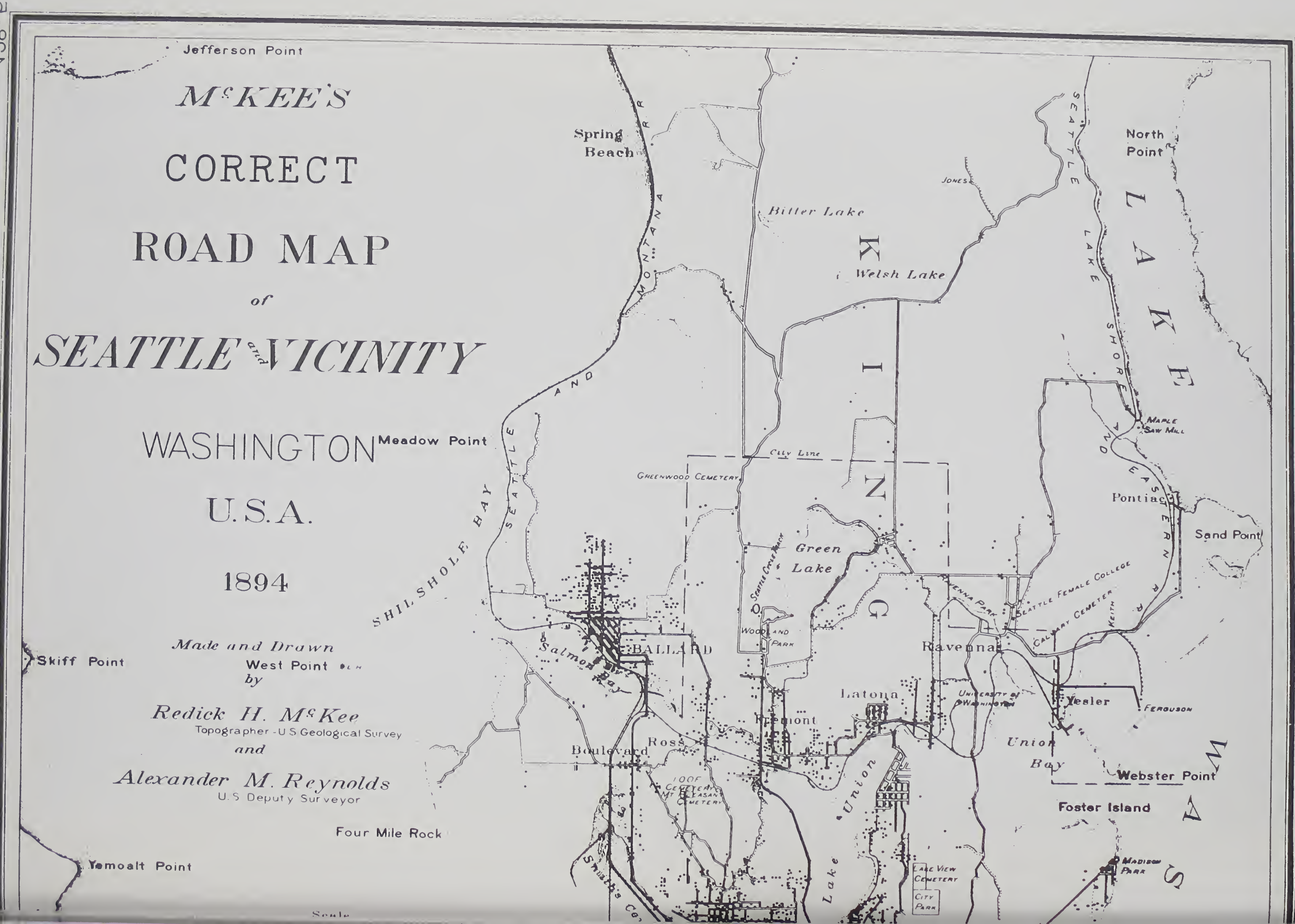
Comprehensive Plan of Seattle 1956

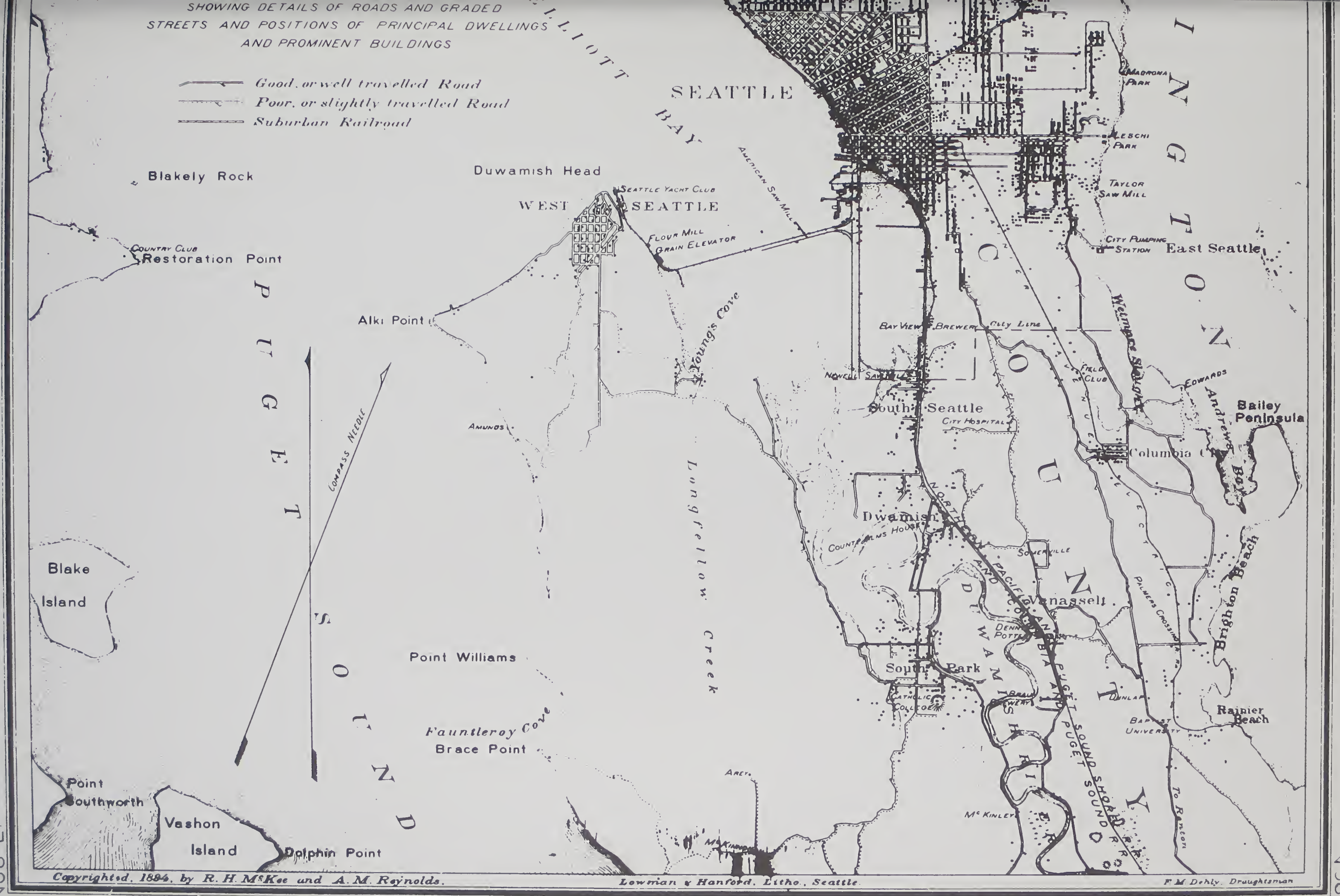
458-2

McKEE'S CORRECT ROAD MAP of SEATTLE and VICINITY WASHINGTON U.S.A.

1894

Made and Drawn by
Redick H. McKee
Topographer - U.S. Geological Survey
and
Alexander M. Reynolds
U.S. Deputy Surveyor





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Lowman & Hanford, Litho., Seattle.

F M Dehly, Draughtsman

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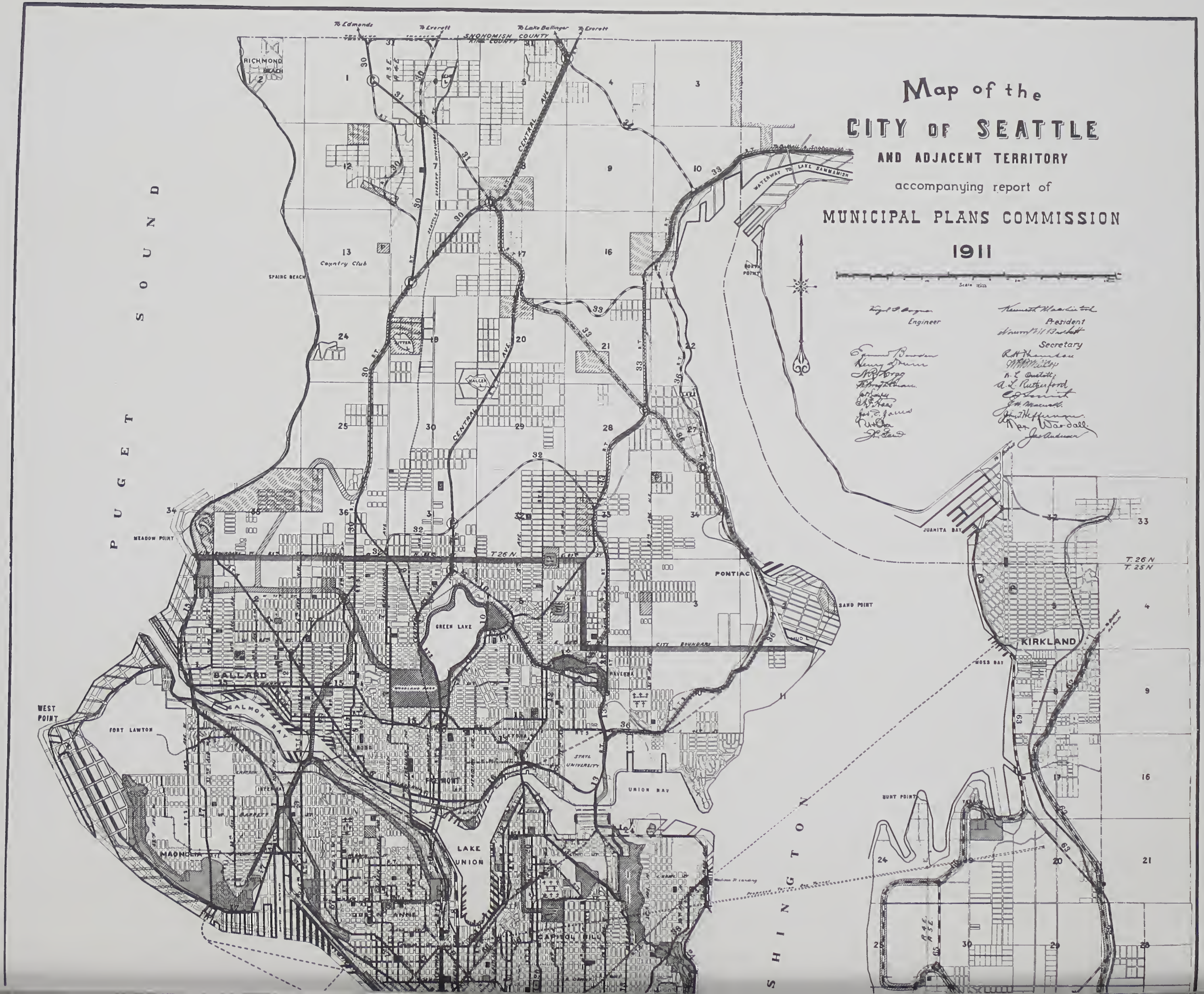
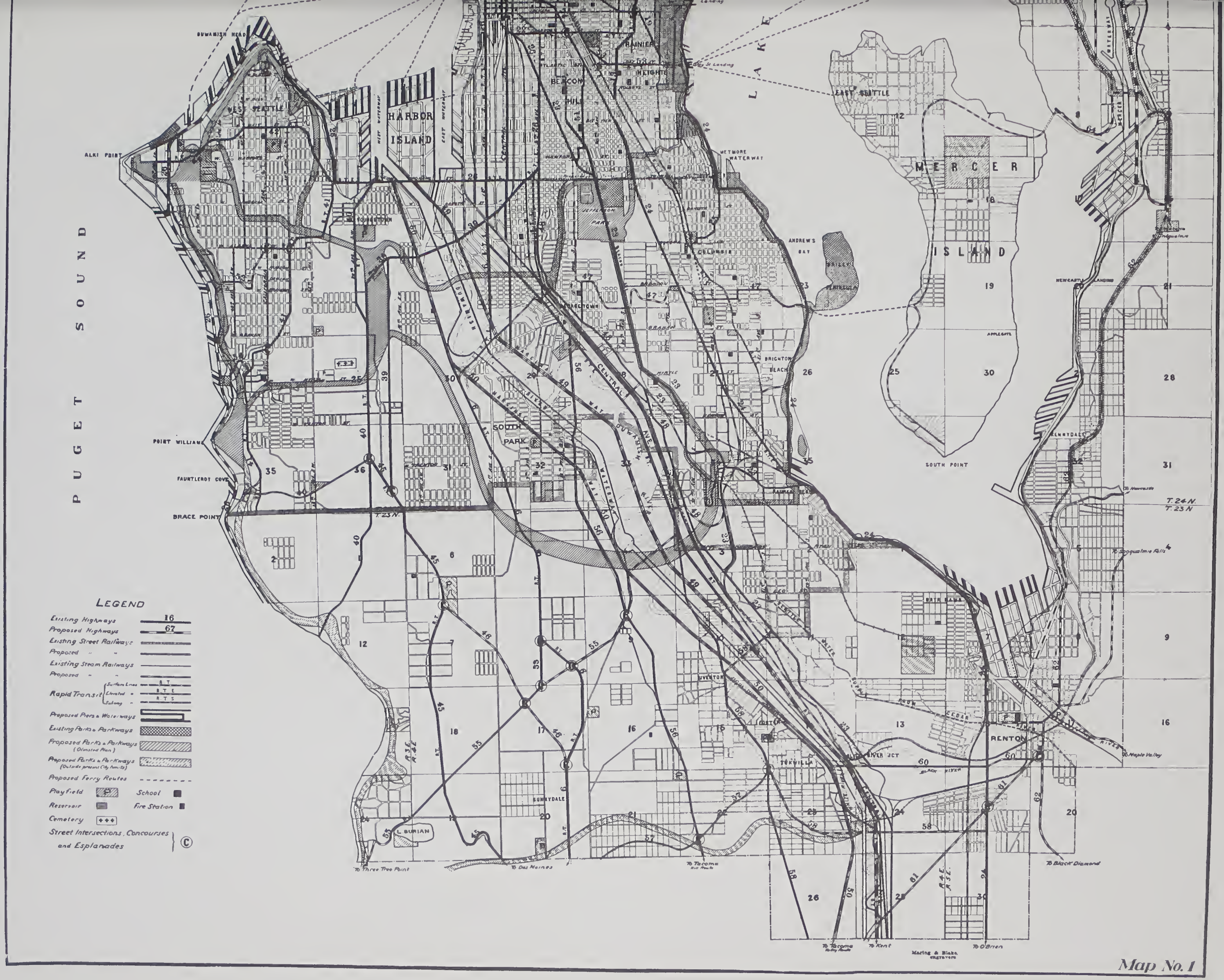

Map of the
CITY OF SEATTLE
AND ADJACENT TERRITORY
accompanying report of
MUNICIPAL PLANS COMMISSION
1911
Scale
Engineer
President
Secretary
A. L. Rutherford
Max Wardall
To Edmonds
To Everett
To Lake Ballinger
To Everett
SNOHOMISH COUNTY
KING COUNTY
RICHMOND BEACH
CENTRAL AVE
WATERWAY TO LAKE SAMMAMISH
To Bothell & Snohomish
NORTH POINT
Country Club
SPRING BEACH
PUGET SOUND
MEADOW POINT
T. 26 N
T. 25 N
JUANITA BAY
PONTIAC
SAND POINT
CITY BOUNDARY
GREEN LAKE
KIRKLAND
MOSS BAY
BALLARD
RAVENNA
WEST POINT
FORT LAWTON
SALMON BAY
FREMONT
STATE UNIVERSITY
UNION BAY
HUNT POINT
LAKE UNION
MAGNOLIA
CAPITOL HILL
WASHINGTON
R. 4 E.
R. 5 E.


PUGET SOUND
LAKE
MERCER ISLAND
HARBOR ISLAND
WEST SEATTLE
BEACON HILL
RAINIER HEIGHTS
EAST SEATTLE
SOUTH PARK
RENTON
TUKWILA
SUNNYDALE
L. BURIAN
DUWAMISH HEAD
ALKI POINT
POINT WILLIAMS
FAUNTLEROY COVE
BRACE POINT
ANDREW'S BAY
BAILEY PENINSULA
SOUTH POINT
WETMORE WATERWAY
NEWCASTLE LANDING
KENNYDALE
COLUMBIA
GEORGETOWN
BRIGHTON BEACH
YOUNGSTOWN
DUWAMISH
CENTRAL AVE.
T.24N.
T.23N.
R.4E.
R.5E.
R.3E.
To Three Tree Point
To Des Moines
To Tacoma
To Kent
To O'Brien
To Black Diamond
To Maple Valley
To Snoqualmie Falls
To Newcastle
Maring & Blake engravers
LEGEND
Existing Highways 16
Proposed Highways 67
Existing Street Railways
Proposed " "
Existing Steam Railways
Proposed " "
Rapid Transit { Surface Lines R.T.; Elevated " R.T.E.; Subway " R.T.S.
Proposed Piers & Waterways
Existing Parks & Parkways
Proposed Parks & Parkways (Olmsted Plan)
Proposed Parks & Parkways (Outside present City limits)
Proposed Ferry Routes
Playfield P
School
Reservoir
Fire Station
Cemetery +++
Street Intersections, Concourses and Esplanades } C

Map No. I

Early Day Planning

PLANNING for the City's growth and development isn't an entirely new thing: beginnings were made in 1889 by Colonel George E. Waring. R. H. Thomson, the City Engineer, in 1892 planned building of extensive sewer tunnels, parts of which are still operating in some sections of the City. He also had ideas for an Esplanade along the water front for a driveway and an extended wharf and pier construction to accommodate the largest ships that would come to the area.

New developments required continuing study; various aspects and plans were considered and abandoned. One of these was submitted by the Olmsted Brothers, Landscape Architects. It consisted of the first report, submitted to the Board of Park Commissioners October 19, 1903, and a supplemental report January 25, 1908, entitled "A Comprehensive System of Parks and Parkways." They began with the southeasterly end of the young city at Bailey Peninsula, now known as Seward Park, and indicated areas within the City Limits which appear to comprise the list of our current parks. The plan also included areas to be considered for future acquisition. A drive was laid out through Seward Park for the use of carriages and riders, but the curved street became too narrow to accommodate the automobiles which later proliferated and the Park Drive was closed to all but pedestrians. The Drive was continuous from Bailey Peninsula to Fort Lawton and included a 2½-mile loop at the Fort, making a total of 23¾ miles.

Small or medium-sized parks were favored; early acquisition of land was urged; Boulevards connecting park areas were planned. Wide boulevards were recommended—125 feet minimum—to include roadways for pleasure driving, commercial traffic, bicycle and walking paths and sidewalks; speedways for horse racing were suggested on certain stretches.

Driveways should follow the lake front as often as possible; view-ways should be placed along the spine or crest of hills and bluffs; short, straight drives should be avoided as inconvenient and ugly.

The Annual Report of the Park Board Commissioners in 1909 seems to have been based on the Olmsted Brothers' study and plan of the Park System and was prepared as information for the Alaska Yukon Pacific Fair visitors who were expected that summer, and to show the citizens how the Park System was developing and improving after the necessary bond issue was so overwhelmingly approved. John Olmsted, of the firm of Olmsted Brothers, Landscape Architects, was chosen to make the survey and report which was accepted by the Park Department on October 19, 1903. It was followed by a supplementary report in 1908, and has been rather closely followed during the years.

Then, as now, Interlaken Boulevard furnished an entrance from the downtown area to the Boulevard System. The Drive at that time connected all of the 12-mile Parkway and the park areas of some two thousand acres.

The 14 original parks in the Olmsted Plan varied in size from 200-acre Woodland Park to 2- and 3- acre neighborhood parks. These have been equipped for various uses such as athletic and play-fields for teenagers, play areas for young children, wading pools, bicycle paths and picnic areas.

Denny Park was the first, donated in 1884; Kinnear Park was accepted in 1887. All the areas of the City were provided with recreation and open-space areas which were acquired by gift, purchase or setting aside in the platting. The boulevards were connecting links for the larger parks.

The supplementary Olmsted report of 1908 dealt with small parks in recently-annexed territory. First class parks, which were the larger ones, were expected to develop as a result of street planning and by gifts of land owners. The smaller parks were like scraps of different sizes left over or unusable in development of the various plats.

It is reiterated that boulevards are usually 200 feet wide with more than one formal grass strip and formal plantings; they are uniform in width for long distances and have continuous formal design.

A parkway has a large area of informal, natural landscaping and the width varies. Some natural feature enhances either the center strip or one side of a parkway, or it may follow a lake, river or seashore. Neighborhood parks within a half mile of every home, and playgrounds, both for small children and for teen-agers should be provided.

In 1908, the Olmsted report indicated that park area should be 5% or 32 acres in each square mile of the City. Seattle's park area then was about 3½% of the total. A number of small parks in the annexations were listed and another group of larger areas recommended for the larger-sized parks.

Additional suggestions were made for improvements of plans of previously-considered boulevards and parkways. R. H. Thomson, the City Engineer, recommended the acceptance of these reports by the Board of Park Commissioners.

After the end of the Alaska-Yukon-Pacific Exposition in the fall of 1909, the Municipal Plans League, made up of business men from the Chamber of Commerce and other business organizations, prepared and submitted to the City voters at the March 8, 1910, General Election, an amendment to the City Charter. This amendment created the Municipal Plans Commission whose assignment was to procure plans for the arrangement of the City to meet probable future demands. It was to act in conjunction with the Park Board when considering extensions of the Park and Boulevard Systems. The amendment passed with a large majority.

The new Commission soon secured the services of Virgil Bogue, who was known worldwide and had been a Professional Engineer under the direction of Fredrick Law Olmsted. He had been involved in the Cascade Mountain Tunnel construction for the Northern Pacific Railroad and with waterfront installations in Seattle and Tacoma. His report, dated August 24, 1911, is comprehensive, comparative, detailed; it shows his knowledge of modern developments in older cities. From these experiences, he envisioned the improvements and requirements that might be accomplished to help the very young city on Puget Sound achieve its destiny.

He proposed a Civic Center on the "magnificent setting" at 4th Avenue and Blanchard Street of sufficient size to accept "its noble buildings (which) would emphasize the natural and exceptional beauty and dignity of their environments." While his vision was not to be fulfilled exactly, it is interesting to note that the 1962 World's Fair site, now known as "Seattle Center" is only a short distance north.

The Bogue Plan included arterial highways and rapid transit routes along many of the streets and thoroughfares as we know them sixty years later. While the plan calls for several traffic tunnels which were not built, several sections of elevated traffic separators are in use today, chief among them being along Garfield Street and Spokane Street.

In connection with the latter, Bogue's insight is prophetic: ". . . there has never been, and never will be, a draw (drawspan) operating between two parts of a busy town that did not prove a serious drawback to every interest, public and private, therein involved.

"The people to be served by the draws contemplated here would be taught a speedy and unnecessary lesson of patience and endurance."

CHAPTER 1

The Regrading Years

1. DENNY REGRADE NO. 1

In 1876, as was mentioned earlier, a comprehensive regrading of First Avenue from James Street to Pike Street was completed and the hill on First Avenue at Cherry Street was eliminated. Deep gullies in James Street were filled, Second Avenue was drained by ditching, and Fifth Avenue was cleared of brush and trees out to the foot of Denny Hill. In 1879, Yesler Way was improved with a plank roadway and the planking program was continued until the early 1900s.

In 1885 street grading was accomplished by contract on twenty-eight streets, including Second and Third Avenues South, and Fourth and Ninth Avenues. This was the beginning of a program that was to continue intermittently until the 1930s.

The Seattle Hotel was the finest in Seattle in 1888, but business increased to such an extent that all the visitors could not be accommodated. Another hostelry was therefore planned and built further north in the square between Second and Fourth Avenues from Stewart to Virginia Streets. It stood in the center of this high ground with a magnificent view of the Sound and of the surrounding hills and mountains, and was known as the Denny Hotel. Its only access was by horse and carriage from First Avenue; this proved to be a drawback and finally resulted in its closure even before it was completely finished.

When President Theodore Roosevelt was planning a visit to the city after the fire, the hotel was reopened and a new approach was installed from Third Avenue and Pine Street. Around 1895 a counterbalanced trolley line

Councilman Wayne Larkin who obtained the Official Bicentennial Project designation for this Narrative History.

was built to connect the entrance of the hotel with Pike Street; built mainly on trestle and to a ruling grade of about twenty per cent, it disappeared in 1907 when the hotel was razed. Seattle Electric Co. No. 139, a single-truck car built in 1889, shuttled back and forth on the three-block-long route throughout its twelve-year life span.

Much happened through the years to alter the plans that had been made; the most catastrophic of these occurrences was the fire of June 6, 1889, that began in the basement of a wooden building on the southwest corner of First Avenue and Madison Street in a paint shop. A burning glue pot was doused with water, which scattered the fire over the shavings on the floor. The fire spread over all the business district and only the Dexter Horton bank, built of stone, was left; even it was badly damaged. Before the ashes were cold, rebuilding began while business was carried on in hastily provided tents. Planners knew that grades for streets would be raised but there was nothing definite for the builders to go by. The Council ordered First Avenue and Yesler Way to be widened from 66 to 84 feet, and the corners were cut down on some of these streets. Street grades in the vicinity of Yesler Way and to the south were raised from one to thirty-five* feet for various distances. Areaways under sidewalks along several streets in the Pioneer Square area were left at the early grades, creating the "Underground Seattle" tours made popular since the 1960s by William C. Speidel, historian and author. Debris from the fire and excavated material were used to fill in ravines east of First Avenue.

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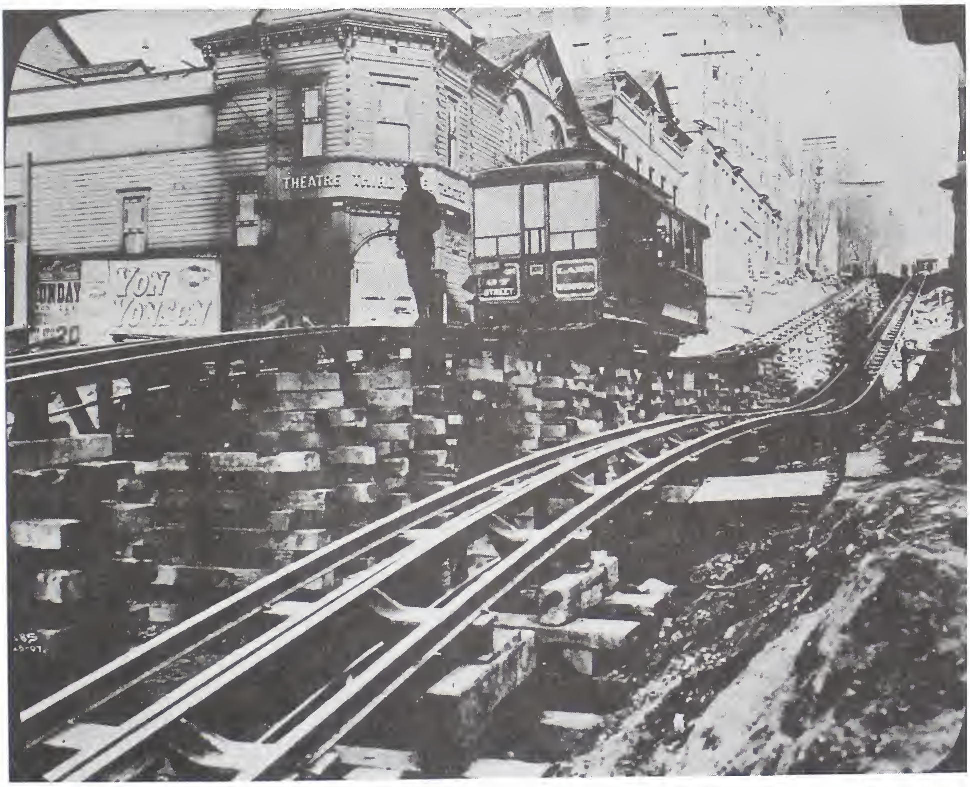
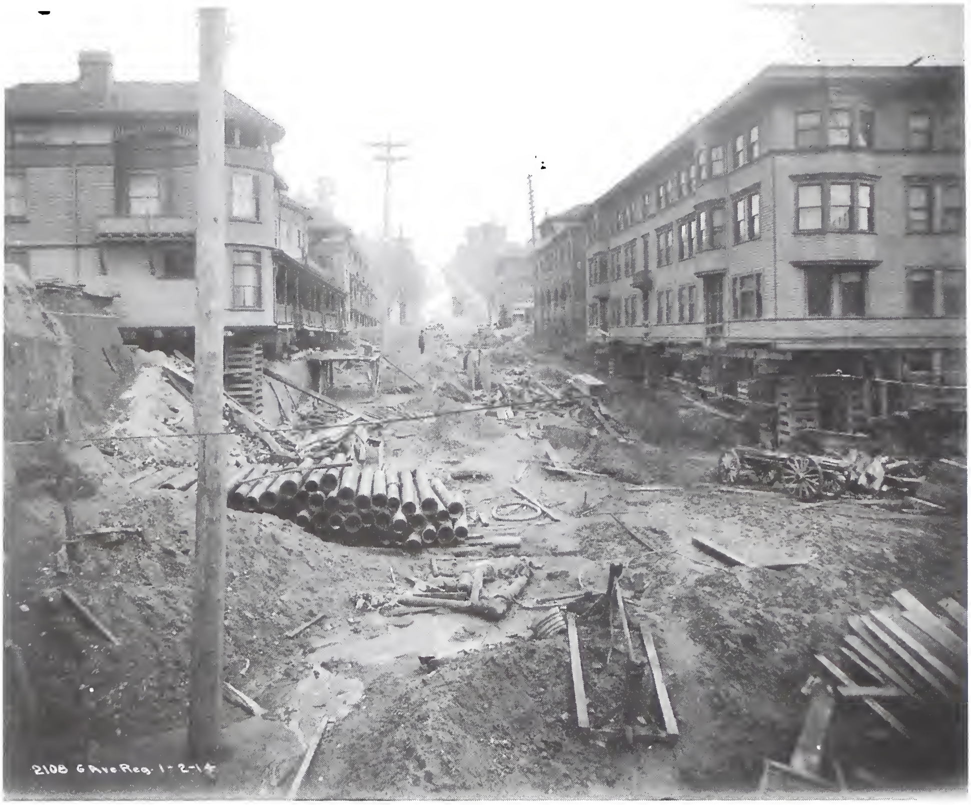
* At Third Avenue South and Jackson Street.

R. H. Thomson had been appointed City Engineer May 25, 1892, and had been advocating the opening of streets to the north and the elimination of the hill which stood in the way. Second Avenue at Lenora Street was 190 feet higher than at Pioneer Square; the grade was too much for a team and the era of the motor vehicle was still many years in the future. Second Avenue was even steeper than First Avenue and the people were anxious to have the permanent grades established. It was the hope of the engineer that Second Avenue could be graded through to Battery Street and that Virginia Street would be lowered some twenty feet. The Denny Hotel Co. and its owner, J. A. Moore, were adamant in their determination that the hilltop hotel location should remain undisturbed. The streets for that reason had



The problems which the downtown regrading projects created for property owners were minuscule compared to those it created for Seattle Electric Co's Street Railway network. The Madison Street Cable line, with its elaborate underground hardware, was particularly hard hit, as evidenced by this 1907 view of the tracks, and cable perched precariously atop the temporary cribwork that supported it while the cutting was in progress. Service apparently continued almost uninterrupted through the project.



East on Columbia Street from 6th Avenue, in the midst of a regrading project that included 6th Ave. from Cherry to Madison Street, Seventh from Columbia to Madison; Columbia St. and Marion Street, one of several such smaller projects made necessary by the First Denny Regrade, in order to provide continuous routes through and near the Central Business District. The original ground level, visible at the far left, gives some indication of the magnitude of the cuts involved. This particular project, undertaken between 1912 and 1915, was financed by a Local Improvement District.

to stop at the foot of Denny Hill and go past it on the west side. Earth from these streets was used in the filling of the deep gullies of Pine and Olive Streets east of Third Avenue. These newly opened streets provided access east to the Broadway District.

In 1898, First Avenue was leveled from Pine Street to Denny Way, the earth being used to fill Western and Railroad Avenues.

One of the City Engineer's old time early employees and a long time friend, Fred McGee, was born in a little house at Eighth Avenue and Stewart Street and was a young lad at the time of this improvement. He remembers that his house was raised 26 feet to attain street level and that the sewer was raised accordingly.

Interested observers anxiously awaited signs of increased profit resulting from the improvements on Second and Third Avenues. The prospective benefits so impressed Mr. Moore of the Denny Hotel group, that he approached the Council for permission to excavate, at his own expense, the streets and cross streets in the block occupied by the Denny Hotel, to the grades which had been established (and to which he had, at first, so strenuously objected). On April 18, 1906, this permission was granted. There was some delay in the execution of this job, but when it was completed, a memo was handed to Mr. Thomson by the Assistant Engineer, Mr. Oscar Piper, which stated that Mr. Moore's delayed compliance with the regrading program had cost him $133,079.22; this, in addition to the sacrifice of his hotel, which had been sluiced down with the hill. In a "letter to the editor" at the time, one of the dissenters admitted that the "terrestrial dunce cap at Second and Virginia was a monument of the political victory won over the Engineer in 1903."[1]

Seattle's regrades attracted much attention in the construction magazines of the day and numerous articles were written on every phase of the operation. The first part of the regrade covered 21 square blocks on the westerly side of the Denny Hill and affected two and one-half miles of streets. Fourth Avenue at Blanchard Street was lowered 107 feet and Fifth Avenue at Blanchard was cut down 93 feet.

Private owners arranged individually with the contractor to have lots graded and they paid him directly. The City was in no way responsible for these contracts. Several of these privately owned "pinnacles" remained in the Denny Regrade area until well along in the 1920s.

Other more intractable citizens, feeling that their property rights were being violated by the regrading projects, went to court to attempt to block them, and sometimes succeeded in tying up work for months. Contractors were instructed to sluice around the properties in dispute, with the result that many of the recalcitrants found their lots isolated on 50- or 60-foot pinnacles, with no way of getting to them.

When the regrading was far enough along to accommodate it, J. A. Moore built the Washington Hotel Annex on the south side of Stewart Street, and work began on the New Washington, the Moore Hotel and the Moore Theater on Second Avenue between Stewart and Virginia Streets. It is interesting to note that the top of the Moore Theater, when built in 1907, was about at the height of the ground floor of the old Denny Hotel that once stood on the hill east of it.

DENNY REGRADE STATISTICS

Smart and Company had the contract for First Avenue from Pine Street to Denny Way in 1898. The street level was lowered for practically the entire distance, in some places as much as 17 feet. 110,700 cubic yards of earth in all, was moved; some being used to fill low lands along Western and Railroad Avenues; most, however, was wasted in Elliott Bay.

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[1] Had Mr. Thomson's plan been carried out, the incline on Olive Way would have resulted in a climb of some 12 feet less from Frederick and Nelson's store to Second Avenue. As it was, the cut under the concrete floor of the hotel down to the grade of Third Avenue was 141½ feet.

C. J. Erickson had the Pike Street job between July 27, 1903 and February 4, 1904, and Pine Street from August 26, 1903, to April 11, 1905. Second Avenue from Pike Street to Denny Way was awarded to him on August 29, 1903.

H. W. Hawley was awarded the private contract of J. A. Moore for Stewart Street, between Second Avenue and Fourth Avenue, and his steam shovels began work in 1905. Surplus water from the city mains was used with a giant hydraulic jet beginning in 1906, but the supply was still insufficient. The railroads were slow in moving supplies because of the surplus of freight, and it was not until February 1, 1907, that machinery was installed on Elliott Avenue at the intersection of Stewart and Virginia Sreets and "the largest pump in the northwest" was started, using water from the harbor. It was an 800-horsepower motor connected to a four-stage turbine by a belt, and guaranteed to deliver 3,500 gallons per minute against a pressure of 180 pounds per square inch at the pump, or about five million gallons of salt water every 24 hours.[2]

Many difficulties attended this operation, but it demonstrated the feasibility of the hydraulic method of regrading in Seattle. The pump was still operative in 1910.

Westlake Avenue and Fairview Avenue were opened around Lake Union in 1910 and 1911, and the earth was used in the nearby ravines and basins easterly of Sixth Avenue. But the biggest job was the leveling of Denny Hill, which was done in two operations. The first part covered the westerly side of the hill as described earlier. Contract for the second part was awarded to Rainier Development Co., the lowest of three bidders, on August 7, 1907, and work was ordered to begin the following June. On August 4, 1908, the contract was assigned to Grant Smith and Co. and Stilwell, with the consent of the Board of Public Works written and sealed on the reverse of the original document. Other contractors on this portion of the regrade were Smart, Hawley and Erickson, Hans Pederson, Ottesen and Jensen, Grant Smith, Paul Steenstrup, P. J. McHugh and the Rainier Development Co. Harrison Street was the last unit awarded and was finished by P. J. McHugh on October 31, 1911. These contractors continued to operate on various other jobs connected with the City for many years.

A third system of hydraulic giants was utilized when the Lake Union Shore pumping plant was installed; this added 18,140,000 gallons of water per day to the sluicing operation. By February 1910, the project was 98% complete; 3,002,840 cubic yards of earth had been removed, most of it carried by flume and tunnel into the harbor where permission to discharge had been given by the United States government, provided a minimum water depth of 40 feet at low tide was maintained. The point of discharge had, therefore, to be continually shifted outward into the deep water, and this was done by driving piles in the fill to support the flume. The fill was fanned out and three sluice-ways provided, two being in use while the pile driver was extending the third. At the end of 1910, the flume was approximately 1,200 feet beyond the outer harbor line, or a total length of over 1,900 feet westerly of Elliott Avenue. 125-foot piles were driven into the fill only, the water depth having originally been about 200 feet at this point.

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[2] Capacity of the entire Seattle water system then was about 23 million gallons per day.

Dirt was moved by the dirt trains and washed into the flume by two small jets supplied by a 2-inch and 4-inch pipe, respectively. Finding a material to line the bottom of the sluiceway and resist erosion presented a problem. Sheet iron, cast iron and even steel plate had been used at different times by several operators, but all wore out with surprising rapidity. Finally wood blocks, placed end grain up to the wear were tried; lasting about two months, they were removed and replaced as they wore out.

In size of area involved, quantity of earth removed and maximum depth of cut, the Denny Regrade surpassed any such undertaking previously attempted, and it aroused the interest of engineers throughout the world. Total condemnation costs for the district amounted to $1,581,932.95. The accepted construction bid was for $980,526. Six million cubic yards of earth and rock were removed in these regrades at a combined public and private expense of about three million dollars.

The Denny Regrade removed many of the steep grades which had been traffic obstacles. Roadways to the north and northwest were opened as well as those to the east of Lake Union via Pine Street and Olive Way. Prior to the regrade, lots near the base of Queen Anne hill were valued at $2,500 each. After its completion the same lots were quoted at $15,000, and in April of 1928, the price was $30,000.

2. JACKSON STREET REGRADE

Beacon Hill stretched along the water front to the old Beach Road and served as an effective barrier between the water front settlement and the Rainier Valley dwellers. As population and industrial activities increased, the need for easy communication between the two areas became more keenly felt, the people in the south part of town desiring better access to the Lake Washington area.

A tunnel was first considered and Mr. Thompson and his assistant, J. C. Jeffry, prepared plans and estimates for both a two-way tunnel and a grade reduction. A 90-foot cut was proposed at Ninth Avenue and Jackson Streets. After considerable discussion and several meetings, the regrading operation was accepted because of its greater benefit to a larger area and in spite of its greater cost.

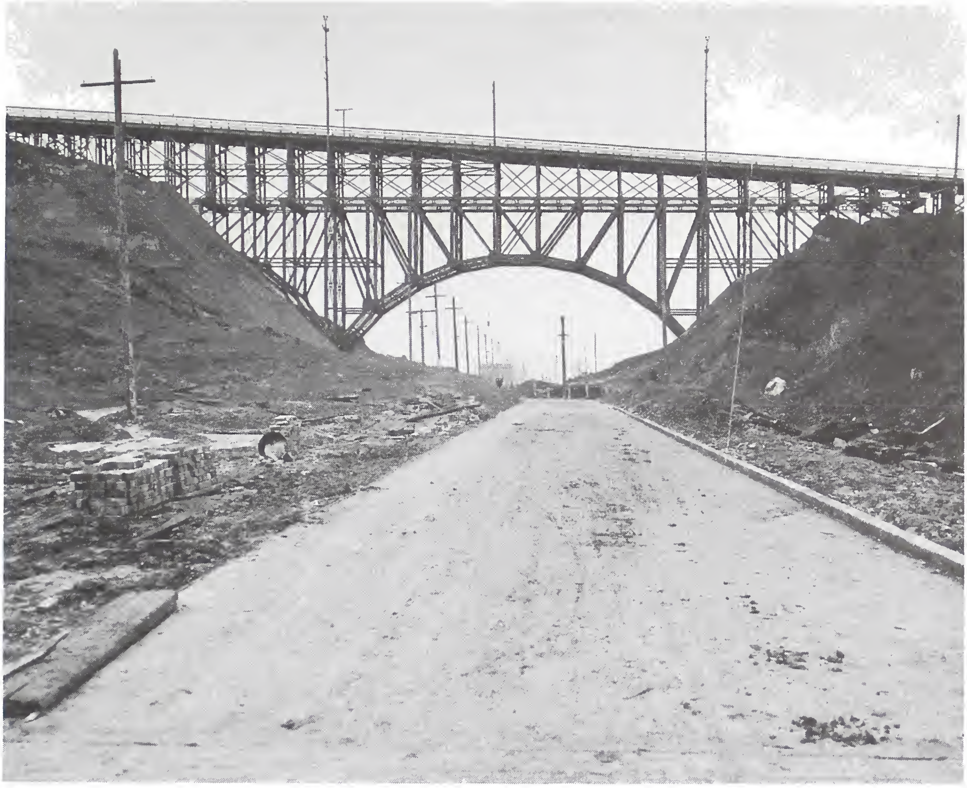
Legal and clerical work had progressed to the point in 1907 where a contract could be awarded to Lewis and Wiley, who were allowed until October 1909 to complete the work. Mr. Lewis was an eastern lawyer who owned inaccessible property in the Rainier Valley area. He was fascinated by engineering processes and sought to realize his thwarted ambitions by organizing an excavating company in partnership with an engineer. Mr. W. C. Morse, a young civil engineer destined to become Seattle City Engineer in 1927, showed him the possibilities of the hydraulic process, and Mr. Lewis worked out the obstacles and got his company financed and operating under Mr. Morse's supervision.

Five and three-quarters miles of streets covering an area of 125 acres or 56 city blocks, were involved in this project. The greatest cut was 85 feet at Ninth Avenue and Jackson Street; the grade of Jackson Street was reduced from 15.16% to 5.04%; and the street was widened from 66 feet to 96 feet. Grades on the streets to the north of Jackson were left steep but to the south they were brought down to 7.25% at the maximum on Weller Street and correspondingly on the other streets. On Fourth Avenue, grades averaged 0.4% to 2.9%; and on Sixth Avenue, from 0.07% to 4.5%. Of the 56 blocks, 27 had to be filled and 29 excavated.

Dearborn Street grade was reduced from 19% to 3%, the cut at Twelfth Avenue South being 112 feet. The route to Rainier Valley achieved the long-sought "less than 5% thoroughfare from salt to fresh water," the grades being practically level along Rainier Avenue to Lake Washington.

The steel arch bridge at 12th Avenue and Dearborn Street was part of the Dearborn Street job. It was about 420 feet long on Twelfth Avenue and crossed Dearborn Street 110 feet above grade; it was the only connection with the otherwise isolated portion of Beacon Hill. The Twelfth Avenue Regrade connected Jackson Street and Denny Way, the two general regrade systems at opposite ends of the City. Fourth Avenue South was completed to Holgate Street on a fill several feet above the surrounding area, which was later also gradually filled, adding some 80 acres to the adjoining business district.

Most of Seattle's hills are layers of stratified, hard blue clay, interlayered with sand and gravel and ridges of naturally cemented glacial till known as hard pan, most of it under a sandy loam top soil, sometimes as much as 30 or more feet in depth. There is practically no rock formation, but many boulders from one foot to ten feet in diameter were washed out. Most were hauled away for use in walls and terraces. Throughout the clay were many smooth but irregularly shaped, flat, hard stones. The clay strata were generally horizontal and shattered sufficiently with only light



Twelfth Avenue Bridge West on Dearborn Street March 24, 1913

blasting. The sluicing operation was carried to within a foot of the finished grade, the final grading being done with horsedrawn scrapers.

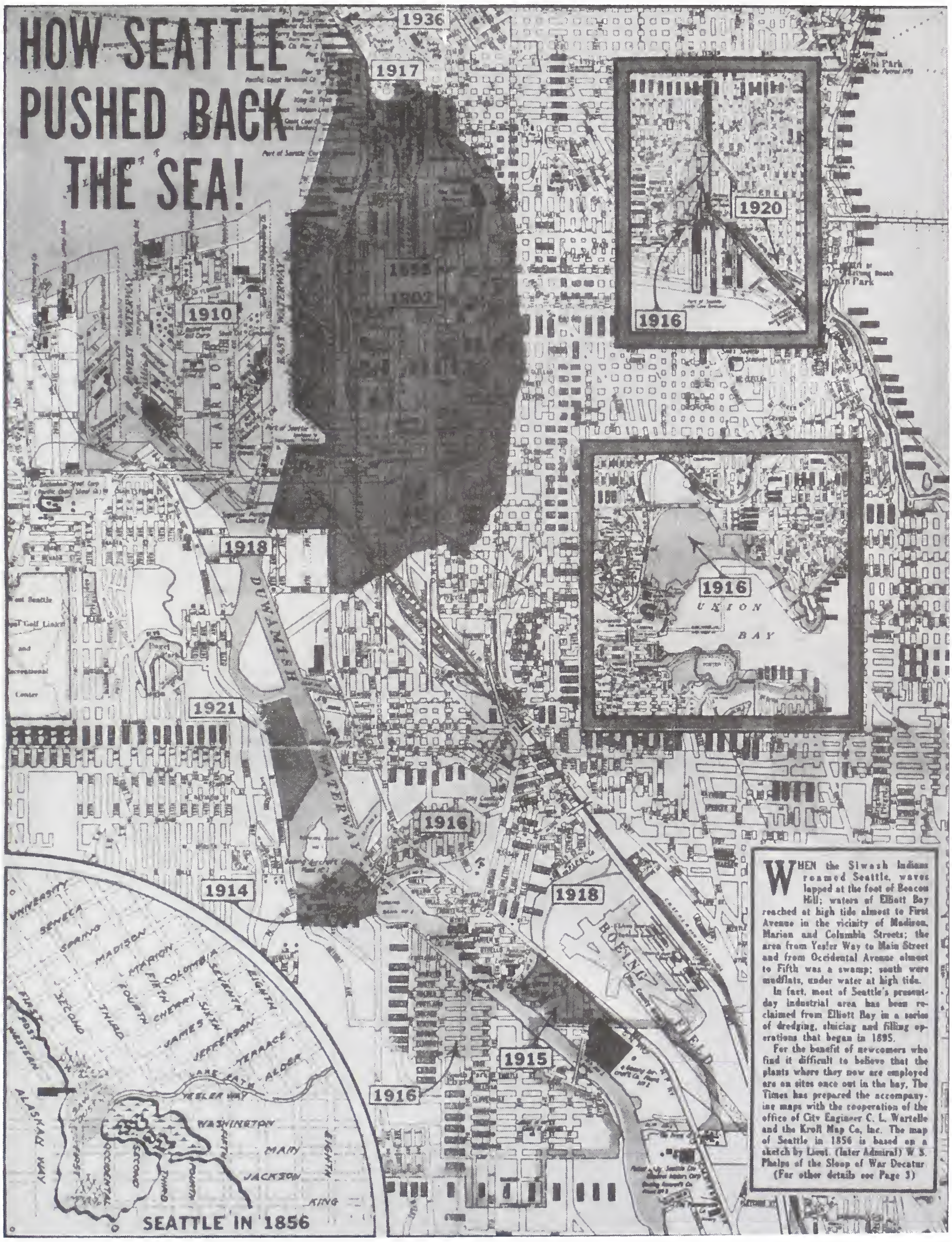
Water for the sluicing came from three sources. The Beacon Hill Reservoir was first tapped. An auxiliary supply came from the abandoned pumping station at the foot of Holgate Street on the shore of Lake Washington. The City received $3,000 a year for the use of this plant and it supplied about six million gallons a day to the operation, pumping to the Beacon Hill Reservoir. The contractors also built a pump house at the foot of Connecticut Street and added twelve million gallons of salt water per day to their supply. This pump house was a frame building, 31 feet by 37 feet, constructed on a foundation of cluster pilings some 200 feet from shore. The pumps were set inside a bulkhead 13 feet by 23 feet with watertight floor and 3-foot sides to keep the pumps dry at highest tides. Planking was caulked for extra precaution. Deep channels and a well were dredged to accommodate the suction pipes. The salt water line was protected by three coats of coal tar and it was left filled with fresh water during shutdown time to guard against salt water damage and ravages of sea worms.

The giants used on the sluicing operations were much like those used on the Denny job. Their operators were veterans from Alaskan hydraulic mining operations. The process of mixing water and earth and various soils, and keeping the face of the excavation and the pipe lines open and full to capacity, was an interesting sight that brought full galleries of "sidewalk superintendents." Washings from the cuts were deflected by shear boards into the penstocks and thence into the mud lines. Heavy iron bars in the penstocks kept large lumps, rocks and debris from the mud lines. "Hopkirk's Patent Pipe" was used here as it had been on the Denny, and the same wood block wearing courses had to be provided along the bottom to take care of the wear. Royalties based on a continuous monthly use of 11,000 feet during the period of the work were paid by the contractor for use of this pipe.

The most effective way of clearing the mud lines, which occasionally became plugged in spite of the most diligent care, was to send a wooden ball down to the obstruction. Because it floated, it caused the water to exert greater force in the remaining area near the bottom of the pipe, and this usually cleared the line in about fifteen minutes.

The City's portion of excavation, added to the private property and street railway portions, made a total of 3,347,883 cubic yards of earth removed, for which was used 10,095,594,000 gallons of water from the above sources. The average ratio of excavation to water was 6.72%, or about 1 part earth to 16 parts water. The waste material was deposited on the tide flats north of Connecticut Street in the filling operation. City Engineer Dimock observed that some of these filled the water front to a depth of forty feet. Quoting from his report: ". . . to make such a fill it was necessary to put large quantities of earth into the silt and water until by its weight the silt was squeezed out and a bottom formed. On this as a base, along outside slope lines, shear boards were placed. These consisted of two 1″ x 12″ boards held in place by 2″ x 4″ x 6-foot stakes; as water carrying dirt met these shear boards, it was deflected and the earth precipitated. In this way a fill of about 1½ feet was made when a new line of slopes was determined and the process repeated until a 1½-to-1 slope was built up step by step." Other fills were made by the slower ponding process where the water borne, fine sediments were spilled into ponds. When these were thoroughly settled and dried, the resulting fill was ideal. Practically all the sediment carried in solution was saved by these methods.

Thirty thousand to forty thousand tons of the rock, used as riprap on the waterfront to protect the pilings, came from Telegraph Hill in San Francisco as ballast in the pioneer coal ships. Other rocks at the foot of Washington Street formed what was known as Ballast Island and came in the holds of old sailing vessels from Liverpool, Boston, New York, Valparaiso, Mazatlan, Honolulu, Hong Kong, Sydney and Melbourne.



HOW SEATTLE PUSHED BACK THE SEA!

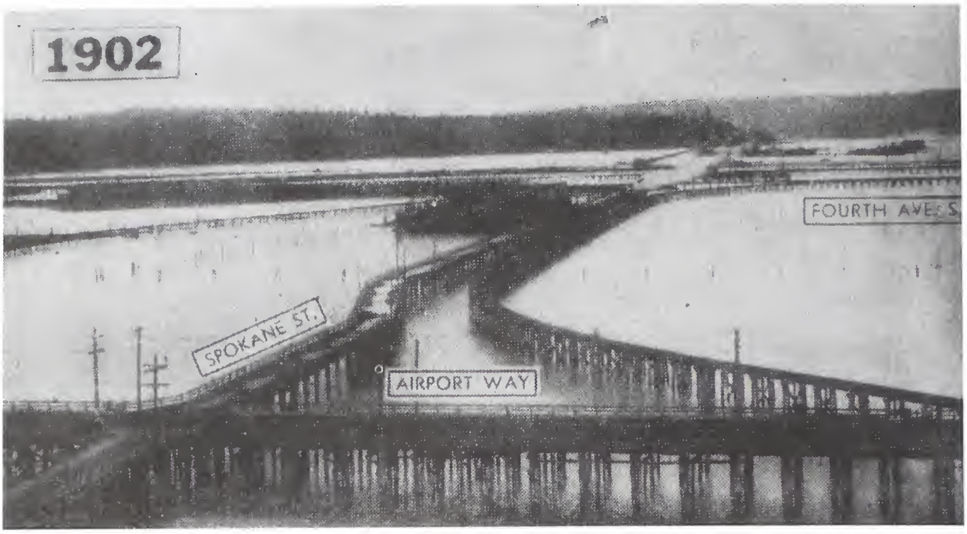
When the Siwash Indians roamed Seattle, waves lapped at the foot of Beacon Hill; waters of Elliott Bay reached at high tide almost to First Avenue in the vicinity of Madison, Marion and Columbia Streets; the area from Yesler Way to Main Street and from Occidental Avenue almost to Fifth was a swamp; south were mudflats, under water at high tide.

In fact, most of Seattle's present-day industrial area has been reclaimed from Elliott Bay in a series of dredging, sluicing and filling operations that began in 1895.

For the benefit of newcomers who find it difficult to believe that the plants where they now are employed are on sites once out in the bay, The Times has prepared the accompanying maps with the cooperation of the office of City Engineer C. L. Wartelle and the Kroll Map Co, Inc. The map of Seattle in 1856 is based on a sketch by Lieut. (later Admiral) W. S. Phelps of the Sloop of War Decatur.

(For other details see Page 3)

Reclaimed Industrial Lands
(Seattle Times Dec. 27, 1942)



West on Spokane St. 1902

The Vulcan Iron Works was a large steel mill located on the water front at 5th Avenue South and Seattle Blvd. (Airport Way) early in the 1900s.[3] Through officials of the Oregon and Washington Railroad Co., which had right-of-way through Vulcan Property, it had protested the raising of the street car tracks and roadways. This protest was called to the attention of the Board of Public Works and of Mr. Thomson, and an agreement was reached. The understanding was that the raising of Seattle Boulevard should begin sixty-five feet west of the Vulcan Iron Works east bulkhead, and that the street be raised about four feet at the bulkhead line, continuing to an elevation of about eight feet. At Maynard Avenue the raising was to continue in such a way as to give the best access for traffic over the roadway, and at the same time make possible the use of car tracks at that point.

The operation was not permitted to progress evenly from top to bottom, the contractor being required to move from one place to another and thus to lose the benefit of the sand in the sluicing operation; this added to his costs because of the extra moving of water and mud lines which had to be constantly changed for the fills, requiring the services of a crew of expert pipemen.

Lewis and Wiley were directed to fill certain portions of the tide flats to a depth of 12 feet below the established grades. These were later completed by using sanitary fill procedures.

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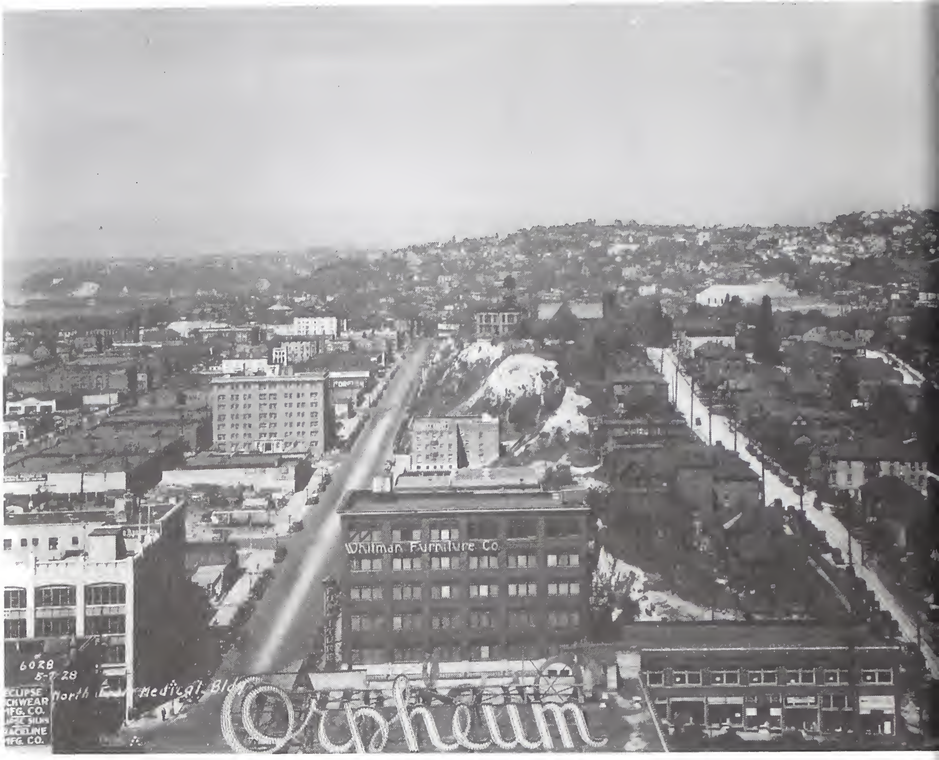
[3] See the 1903 Seattle Directory, p. 134.

With the filling of the tide flat areas, sanitary conditions in the whole district worsened, because of the plugging of drain lines and sewers. Many of the buildings rested almost on the original ground and had flooded during high tides. Some were raised on blocks and filled underneath, business proceeding as usual. Some buildings were worth moving and local house movers did a rushing business; others were destroyed. Grading placed streets in one area on a level with the roof of a seven-story factory building.

Twelve thousand feet of 9-inch box sewer, built of 3-inch lumber, were laid throughout the district at the bid price of 75 cents per linear foot. Another 15,000 feet of sewer was built under various bridge contracts and cost-plus arrangements.

Bridges and trestles were built on many of the filled streets but subsequent settling and pressures of the fill caused some distortion and undermining of foundations. Jackson Street developed several slides because of

West on Spokane Street from I-5 Freeway above Airport Way 1975



Denny Hill as seen from the top of the "gas tank," May 7, 1928. Following the completion of the First Denny Regrade in 1911, property values on the remaining portion of the hill declined steeply, as property owners, in anticipation—or fear—of a second project, neglected to keep up their buildings and lots. The consequent decline of the

its blue clay formation, but these were gradually brought under control.

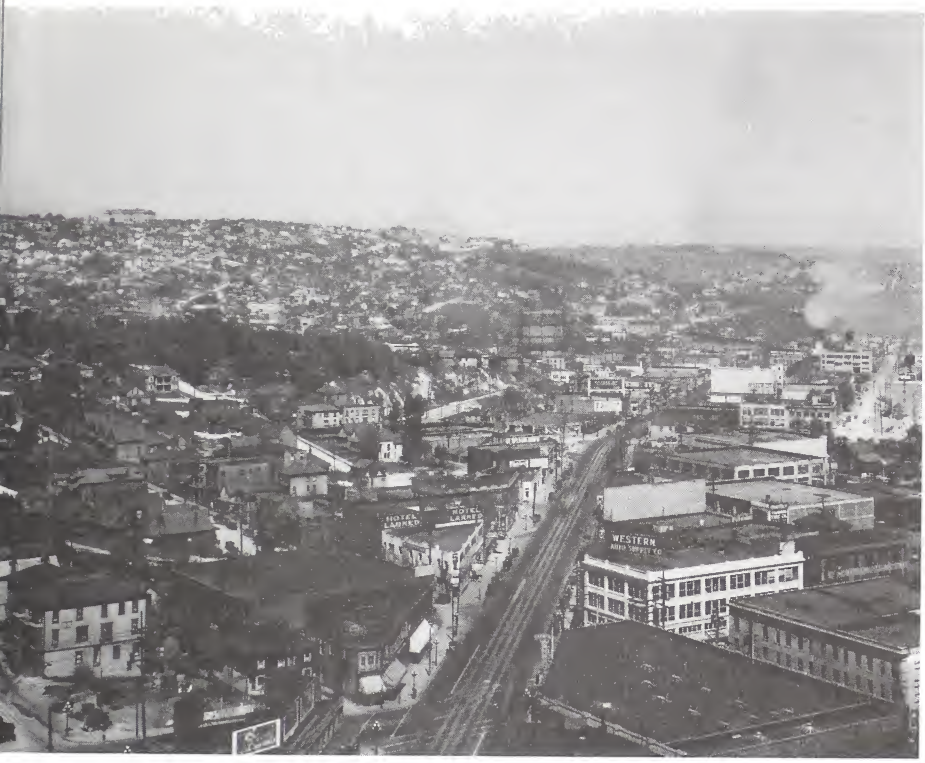
Court House Hill was then the only obstruction left between Denny and Jackson Streets and its lowering had already been provided for in the regrading of Yesler Way, et al, Ordinance No. 23812.

STATISTICAL SUMMARY

3,347,883 cubic yards of earth were taken down from Jackson Street Regrade in 1910.

5,437,128 cubic yards of earth were taken down from Denny Hill Regrade in 1909.

Fill from Jackson Street raised 678 acres of swamp land two feet above high tide—completed 1929. The average cost per acre was $4,400. The average fill per acre was 23,000 cubic yards.



neighborhood thus furnished a ready made argument for the new regrade, in addition to the main contention that the presence of the hill was an obstacle to expansion of the downtown business district.

3. DENNY REGRADE NO. 2

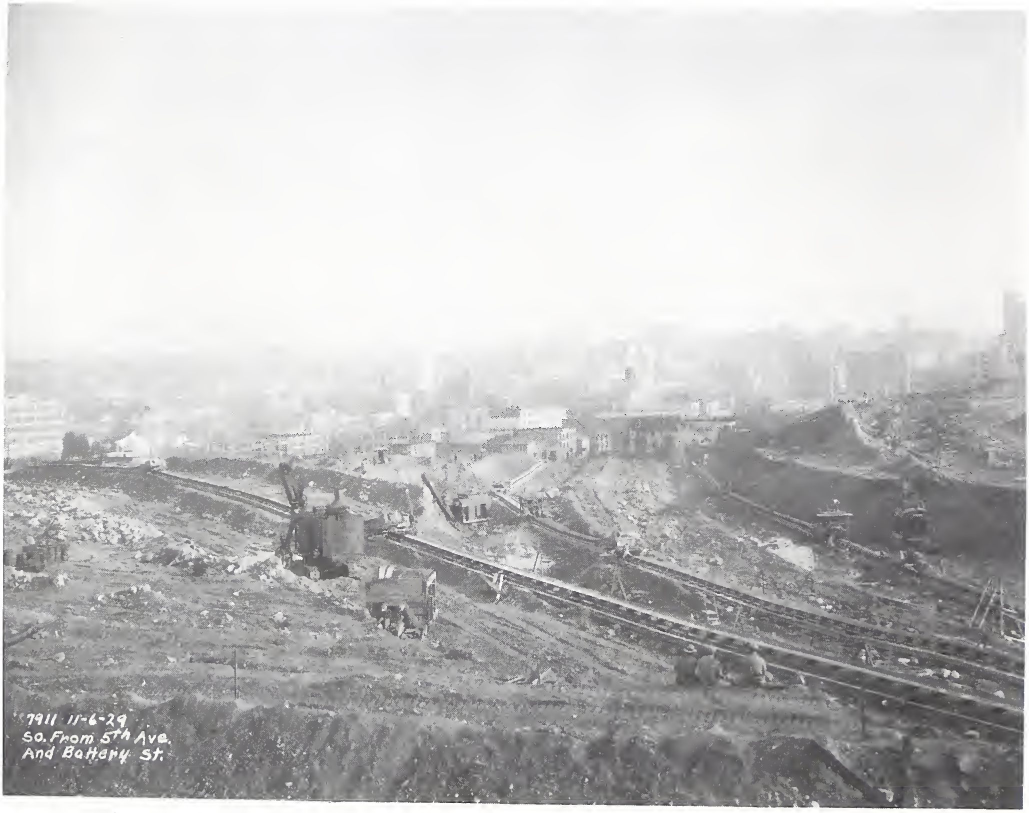
The need for a north-south connection between the Jackson Street and Denny Regrade areas had been considered for many years. Half of Denny Hill stood between the water front and Lake Union and by 1928, conditions and sentiment had developed to the point where it was feasible to advertise the job for contract bids. Since the first regrading, business had gradually extended into the area and the City's growth was continuing to push northward.

Traffic coming in from the north was again forming a bottleneck at Denny Way, and Dexter Avenue was considered important as a connecting link with First Avenue to form one of the four arteries between the north and south sections of the City. It was also conceived of as a right of way for a tunnel ultimately to be constructed to carry traffic on easy grades from north of Denny Way to both Western and Railroad Avenues.

The City Engineer was requested to furnish the Council with estimates of cost for grading streets and alleys in the remaining portion of Denny Hill; necessary condemnations for the rights of way; cost of grading the private property; laying watermains and sewers, and paving all streets and alleys. The same information was required for Dexter Avenue along the easterly slope of Queen Anne Hill and for a combined district, with a suggested outline of the contemplated assessment district. This time the regrading and improving were to be combined in one district, the whole project being officially christened Denny Hill No. 2 or Sixth Avenue, et al, Regrading, etc. The Park Department was requested to take the opportunity to level Denny Park at this time. (March 27, 1928).

As usual in most projects of this nature, a great deal of public interest was generated and there were many meetings and discussions. In 1928, the contract for the leveling of the last of Denny Hill was awarded to George Nelson and Co., and the job got under way. Contrary to normal City experience, Mr. Nelson sublet several of his contracts for shovel work and for the other improvements, resulting in some delay and dissatisfaction.

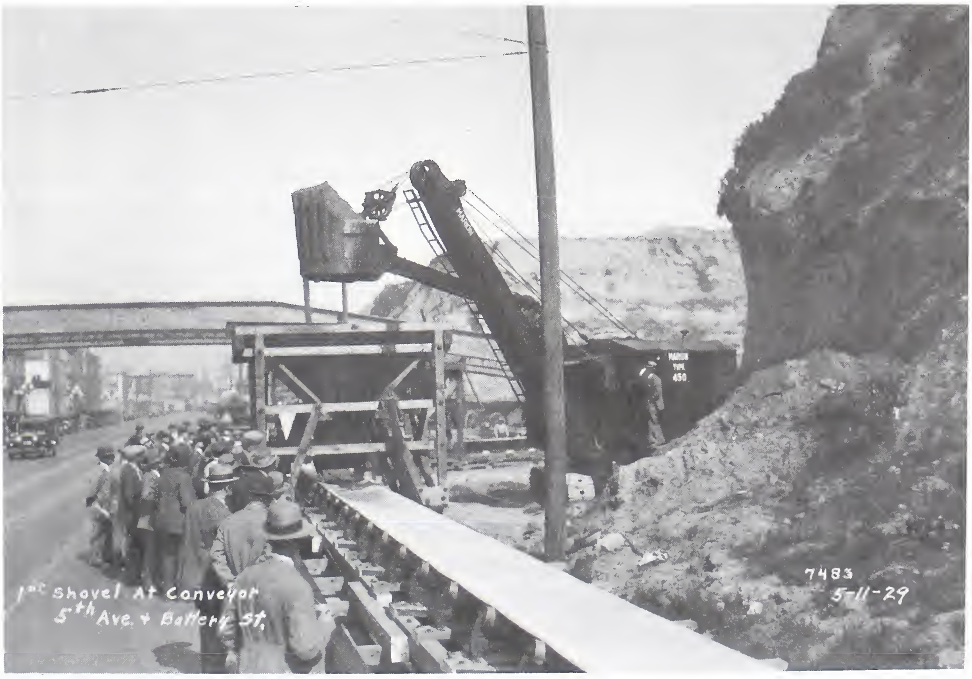
Private property owners were again permitted to arrange with the



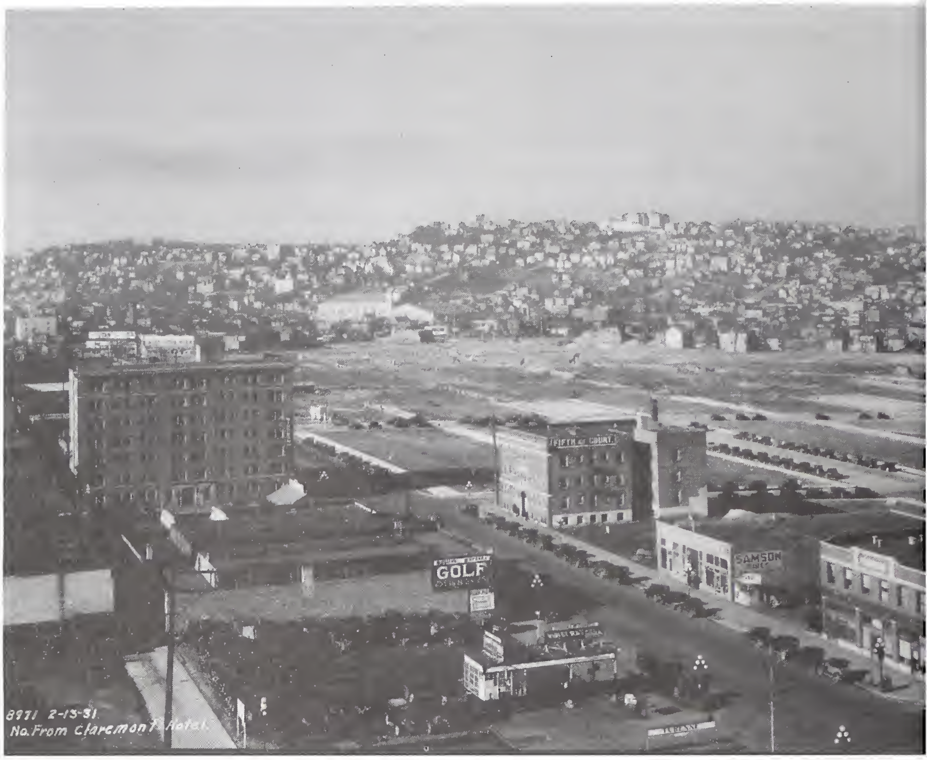
2d Denny Hill Regrade 11–6–29 Southeast from 5th Av. and Battery St.

general contractor for individual work, and a total of 1,523,000 cubic yards of earth were removed from privately owned land at the bid price. Community Club leaders were anxious for the job to be completed so that property owners could sooner realize profit from the improvement, and they kept close check on the progress of the work. The Park Department arranged to have Denny Park lowered to the street level, as had been suggested, and provided for a loan to the Denny Park Construction Bonds Fund in 1930 to cover the cost.

The second Denny Regrade was carried out principally by electrically-operated power shovels and a series of fixed and movable belts. The hill was lowered by sections in the manner of taking blocks from a pile, one layer at a time. The three fixed belts were 36 inches in width. One stretched from the Sixth Avenue and Battery Street intersection to Third Avenue, passing over six street crossings on an elevated timber structure; it was planked on both sides to protect pedestrians and traffic, and to prevent dust nuisance in the more populous areas. Another extended from Third Avenue to Railroad Avenue, and a third carried the earth from Railroad Avenue to the point of discharge on the dock where the scows were loaded. These three belts totaled about a half mile in length; large motors kept them moving at 600 feet per minute. Six shorter belts, 250 feet long and 30 inches wide, carried the dirt from the electric shovels to the main conveyor belts at a



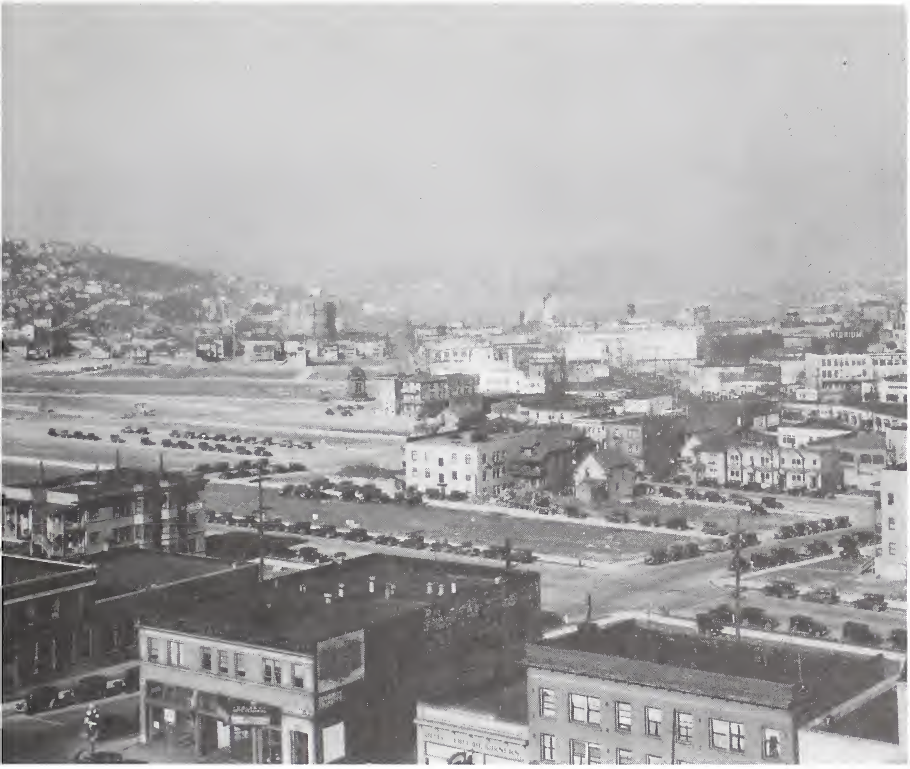
2d Denny Hill Regrade 5–11–29 First Shovel at Conveyor North on 5th Av. at Battery St.



The hill is now entirely removed, and all that remains to be done is the laying of new sewers and watermains in the excavated area—the preparations for which are already well underway. Benefitting from some unhappy experiences in the course of First Denny Regrade, the Second provided for grading, paving, sidewalks, watermains, sewerage and even street lighting to be completed in one contract, avoiding the haphazard and fragmented approach that had characterized the earlier project, and had delayed the installation of needed services in some areas for years.
The Second Denny Regrade area, as it appeared September 22, 1931, after the streets

speed of 400 feet a minute. These were swung around the hill as the work progressed, and hoppers were placed within the reach of the shovels. The braking system was arranged so that stopping any one belt would automatically stop the others, as well as the feeder belts from the excavation area —a fortunate arrangement indeed, as matters turned out, for the main belts had a habit of breaking down at embarrassingly frequent intervals.

The boulders in this typical Seattle hill were carried away by rockery men, and the belts handled all material less than 12 inches in diameter. The self-dumping scows each carried between 300 and 400 yards of earth and rock, and required forty minutes between loadings. Eventually three scows were required to compensate for the lay-ups and repairs. The complete system was capable of moving 15,000 cubic yards of earth every 24 hours, but



had all been paved and the property remanded back to its original owners. The anticipated growth of the downtown metropolitan area into the newly prepared "flatland" was greatly retarded by Depression and War, and when it finally took place, it did so in a manner very different from that which its originators had expected and hoped for.

frequent malfunctionings and breakdowns kept the contractors from maintaining this optimum productivity.

The City's request to dump earth in Lake Union was denied but permission was given to waste it in the deep water of Elliott Bay offshore from the area between Pike Street and Battery Street. This resulted in some "silting up." Before the job was finished the Port Commissioner requested that a dredge be available to level the waste down to the required 64-foot depth at mean lower tide, this contract being eventually executed by Puget Sound Bridge and Dredging Company.

The second Denny Regrade removed 4,233,000 cubic yards of material from City street area; maximum depth of the cut was 89 feet. Property assessments paid for much of the cost.

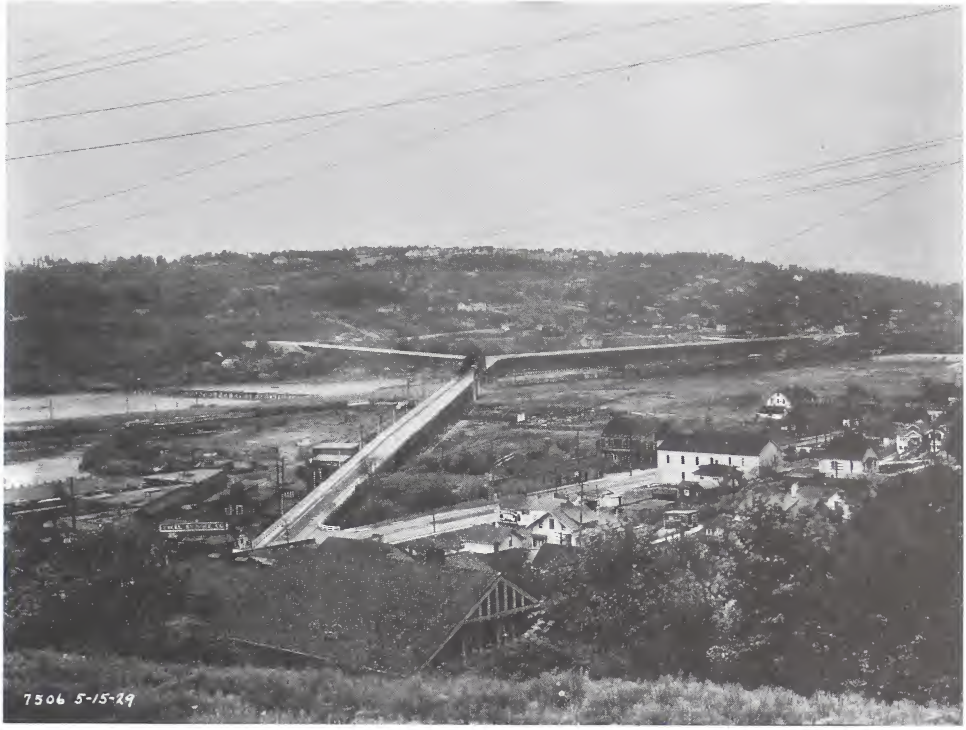
Figures on the total amount of earth moved prior to 1950 in all Seattle's regrading projects vary, but it has been estimated that over one-eighth as much earth was moved at various times to bring the City to its present contour as was moved in the building of the Panama Canal.

CHAPTER 2

Bridges

EARLY settlers established widely scattered home sites on the surrounding hills and the transportation problems that developed have continued to plague the City. Lying between the settled areas were lakes Union and Washington and their respective waterways, Salmon Bay, Smith Cove and its swampy connection with the lake drainage systems, and the Duwamish River and its deltas, to name some of the larger obstacles. At first canoes and row boats were sufficient to make the few crossings necessary for communication between communities, but increasing numbers of people and enticing goods and services in the growing city soon made roadways and permanent crossings necessary.

Looking at a city map we find Alaskan Way and Elliott Avenue leading into Garfield Street to open up Magnolia Bluff, with 15th Avenue West branching off to serve Ballard, Shilshole Bay and Golden Gardens; Westlake Avenue and Aurora Avenue North open the way to Fremont and Phinney Hill; Eastlake Avenue extends to the University District and Roosevelt Way areas; 24th Avenue Northeast goes out to the Montlake District, University of Washington and North Central sections. The Twelfth Avenue South Bridge crosses over to Beacon Hill; Airport Way and the Albro Bridge serve Georgetown, South Park and the industrial area along the Duwamish waterway and into the south end; the 14th Avenue South Bridge connects to South Park, White Center and West Seattle; Eighth Avenue South Bridge connects to South Park, White Center and West Seattle; Eighth Avenue South Bridge which crossed to South Park served its purpose and was supplanted by other routes; the First Avenue South Bridge leads south to White Center, Burien and southwest Seattle; and the Southwest Spokane



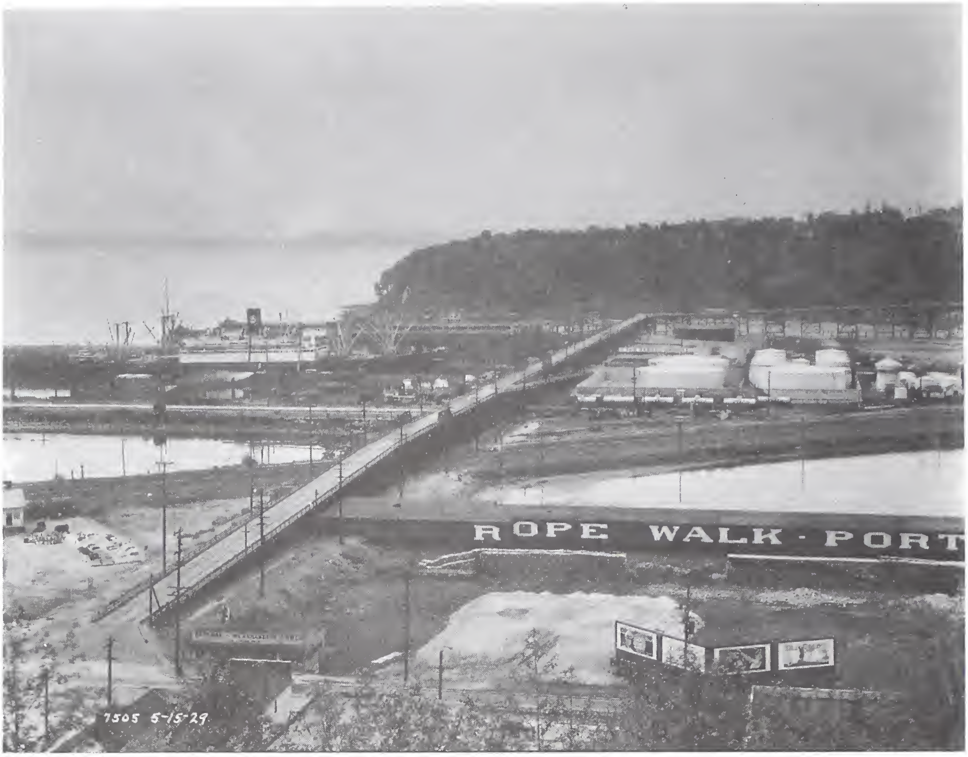
The West Wheeler Street Bridge was originally built in 1914. It was demolished in 1929, and replaced by a new wing of the Lawton Way Overpass, and the entire complex was renamed W. Lawton Way Bridge. By the time it was finally razed in 1949, it had long since outlived its usefulness, the Dravus Street Overpass, completed in 1936 by the State Highway Department (replacing the older trestle described in the text, pp. 35–37, of which no pictures appear to be available), and the 1930 Garfield Street Bridge having between them absorbed most of the traffic across the Interbay "lowlands."

Street Bridges across the waterways provide arterial connections to West Seattle. The bridges at 1st Avenue, 4th Avenue, Albro and Argo, and the Spokane Street Complex carry the traffic over the railroads in the south part of the City; while the West Garfield Street and 15th Avenue Northwest overcrossings perform the same service for the Interbay and Salmon Bay developments.

These modern highway links were preceded by decades of planning, building, rebuilding, relocating—and financial problems.

In the 1890s the nearest bridge over the Duwamish River between the City and West Seattle was located on what was known as Oxbow Bend, or the present Michigan Avenue.

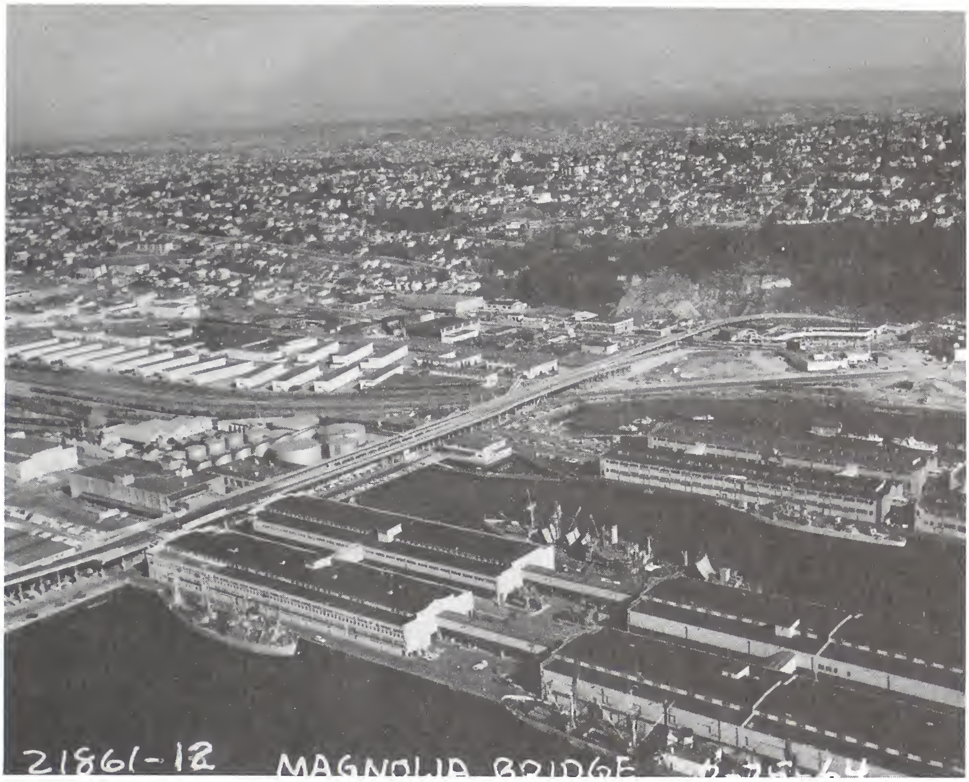
Seattle's first timber trestle bridge was the 24-foot Grant Street plank road across the mud flats from Jackson Street to South Seattle. Built in the 1890s, it followed the route that became known as Seattle Boulevard, now



The plans for the original Garfield Street bridge north of Smith Cove are dated March 1910. During the next 20 years an elaborate network of trestles was built across the lowlands between Queen Anne Hill and the hilly area to the west known as the Magnolia District. By 1929 the original Garfield Street trestle, shown here, was very much in need of replacement; and this was accomplished during the following year by the building of the present concrete structure, completed December 22, 1930.

Airport Way, from Sixth Avenue and Grant Street, which became Ninth Avenue, to about Spokane Street. Until 1900 there were only pile and timber trestle structures; no permanent steel bridges were considered until 1911, when three were constructed: Twelfth Avenue South over Dearborn Street; Yesler Way over Fifth Avenue South; and a drawbridge on First Avenue South at Michigan Street over the Duwamish River, known as the *Oxbow Bridge.* Temporary drawbridges were built on Spokane Street over the West Waterway early in the 1900s, and at Fourteenth Avenue West over Salmon Bay; single spans on Stone Way over the Lake Washington Canal, and on West Garfield Street over Smith Cove Waterway.

The decade between 1910 and 1920 witnessed the City's most ambitious bridge building program and the need was expressed by City Engineer A. H. Dimock for a bridge engineer sufficiently experienced to advise the department. The City Engineer offered the criticism and suggestion that the advice of any one expert was often accepted simply because he was so



Extensively repaired in 1953, the Garfield Street Bridge was fitted with an elaborate grades separation system at its east end in 1957 and 1958. The plans for the grade separation, dated April 1957, as designed by Homer Hadley, incorporated one of the earliest uses of pre-stressed concrete girders in Seattle.

known, but that the true value of hiring such advice was to bring out and stimulate discussion between him and the qualified local people, thereby evaluating all the conditions and attaining a more harmonious plan. The experience of the local men, he believed, should never be disregarded.[1]

As part of a large scale improvement program entered into on a more or less cooperative basis between the City and the major Railroad companies during the period 1909 to 1912, Oregon and Washington Railway and Navigation Co. (Union Pacific) and the Great Northern Railway constructed the reinforced concrete viaducts on Jackson Street from Fourth Avenue South to Fifth Avenue South, on Fourth Avenue South from Jackson Street to Seattle Boulevard (Airport Way), and on Seattle Boulevard from Fourth Avenue South to Fifth Avenue South; and a retaining wall on Fifth Avenue South from Main Street to Seattle Boulevard. The Great Northern

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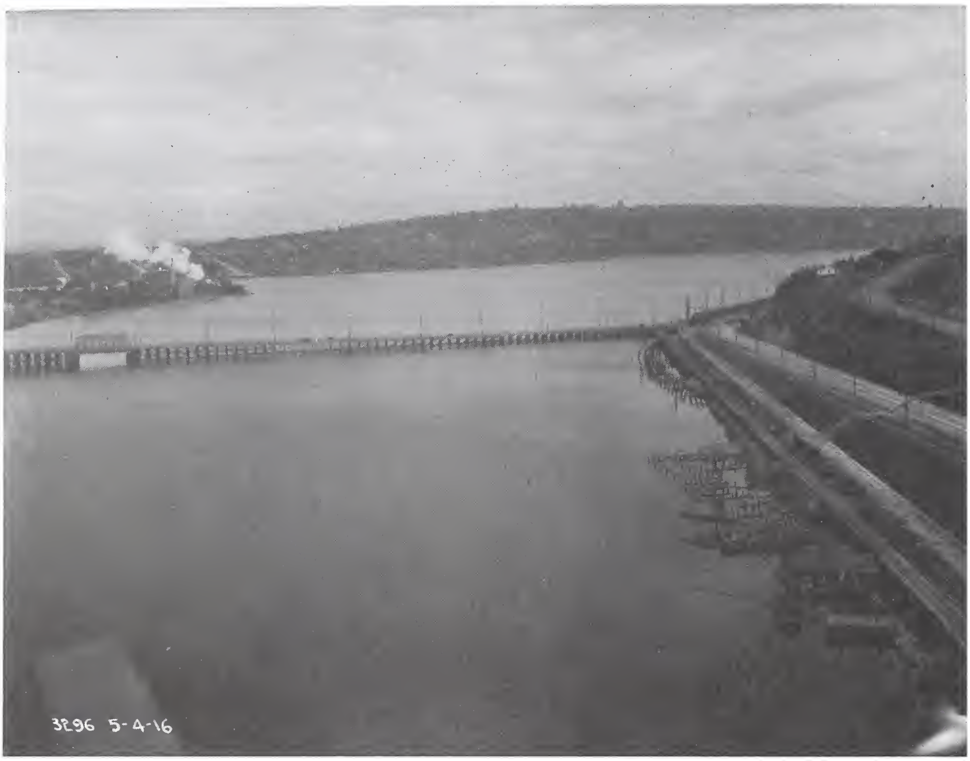
[1] In later years, counsulting engineers have been employed to advise and consult with the Department on many enterprises.



Stoneway Bridge, looking east from about Aurora Avenue. Westlake Avenue, visible at the lower right, had just recently been established as a "land route"; prior to 1911 it had been a trestle hugging the shore of Lake Union. The houseboat colony, later to become a conspicuous feature of Lake Union, was already getting a foothold.

Railway reconstructed the retaining wall on Fourth Avenue South from Main Street to Jackson Street in order to gain additional track room. This structure served the double purpose of retaining the fill and supporting the roadway. Simultaneously with this work, the railroads improved and rebuilt their yard and facilities in the Georgetown area.

Plans for these activities were approved and checked by the Engineering Department and the permits and franchises issued by the City.

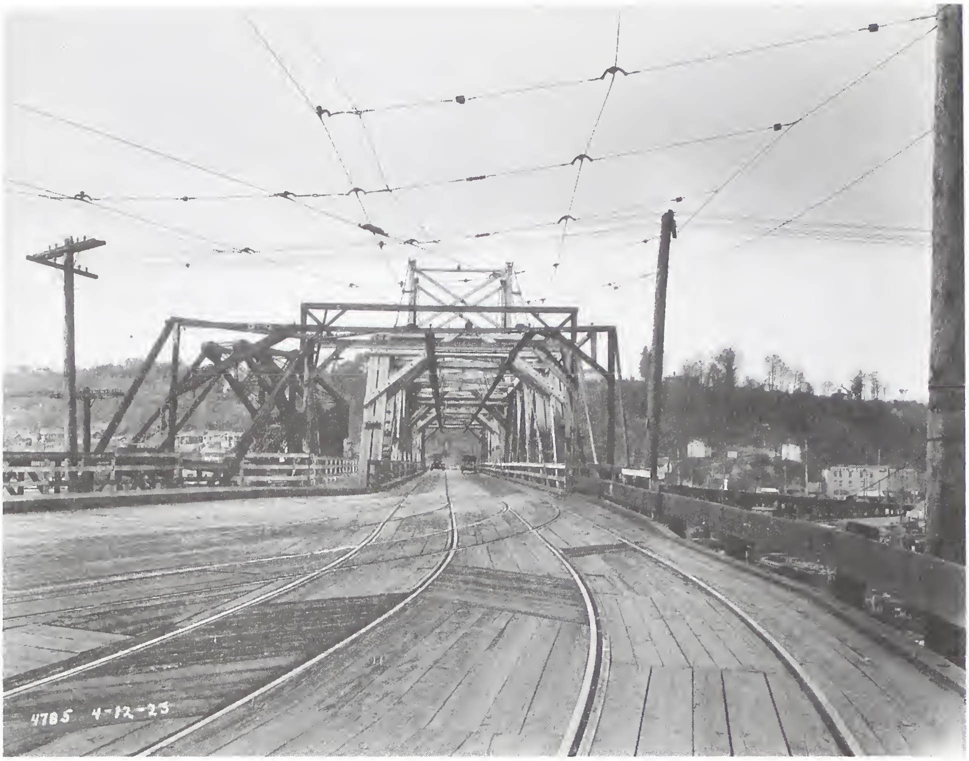
Trucks carrying loads of eight tons in addition to their own weight of five tons were making their appearance on city streets and, with the predominance of planked roadways, were the cause of greatly increased upkeep on both streets and bridges. The statement was made that interest on the cost of construction of permanently finished streets would be less than the maintenance of these plank roads. Experiments were made with asphalt surfacing over the planks (protested by the teamsters as being too slippery), and by the laying of brick pavement on the bridges. A life span of eight to ten years for the brick surface was considered to be economical.

When the regrade and grade separation on Jackson Street and Dearborn Avenue were complete late in 1909, a bridge over Dearborn Street was required. This was a steel bridge with temporary wooden approaches on Twelfth Avenue South. Because it was apparent that the north end of Beacon Hill would ultimately have to be lowered considerably, a wooden trestle was constructed on top of the steel structure, and it and the approaches accommodated the temporary grade of the street. The upper chords of the steel bridge were located at the elevation which was believed to be the ultimate level of the permanent grade. The bridge, 66 feet wide, and on a grade of 1.75%, cleared the center of the paved portion of Dearborn Street by 61 feet. It was opened to traffic in the fall of 1912.

In 1914 property owners east of Twelfth Avenue South and as far south as Judkins Street gave easements so that the grades on the street could be cut through to the south to meet the grade of Golf Drive and Twelfth Avenue South. In the spring of 1917 the water saturated clay of Beacon Hill began to move and the slide destroyed the timber approach at the south end of the bridge; the bridge itself was shifted to the north about thirty inches and slightly bowed laterally. This necessitated raising the entire bridge on improvised supports, reconstructing both main piers and resetting the bridge on secure foundations. The wooden approaches were rebuilt and all damaged parts were put into good-as-new condition. The elevated wooden trestle was removed and a plank deck placed on the steel deck of the bridge.

The first drawbridge across the West Spokane Street Waterway was built in 1902 or 1903 by King County. After West Seattle was annexed to the City in 1907, the City built a drawbridge a little to the north of the street right of way, locating it so as not to interfere with traffic when a permanent bridge was constructed. Approaches were built on leased property. The bridge was ten feet above City Datum, had two clear spans of eighty feet and a 20-foot 4-inch roadway. In 1915 it required replanking and new approaches; its low level was proving most inconvenient, as all traffic up or down the waterway required its opening.

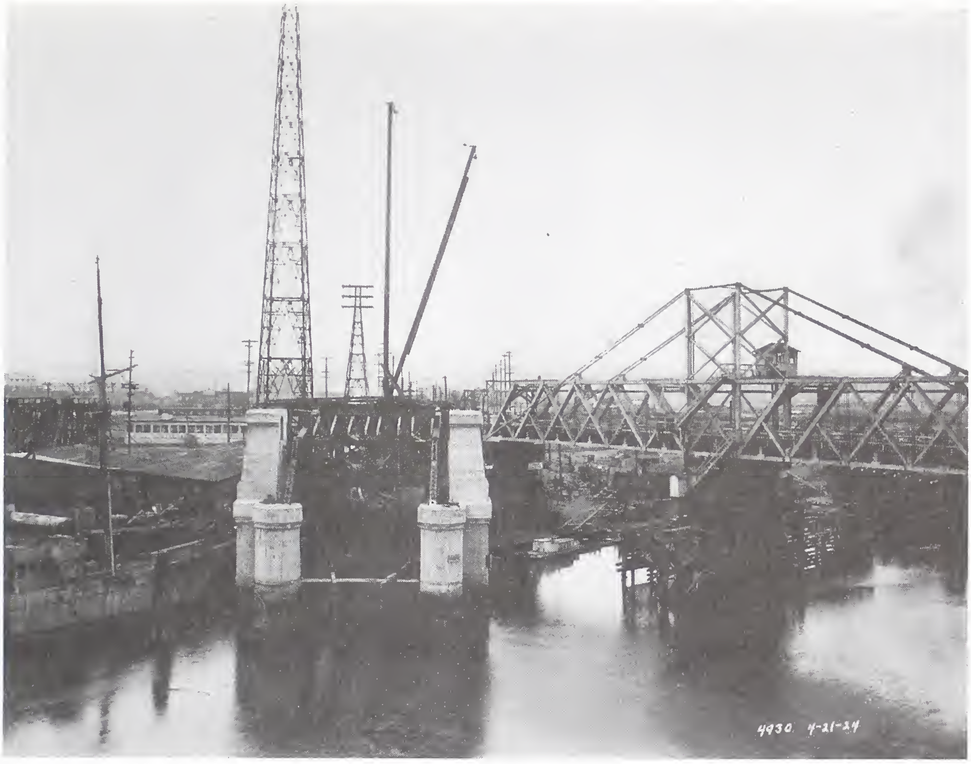
At Spokane Street, grade separation was anticipated and the need for a bridge over the West Waterway at a higher elevation was becoming serious by 1913. In 1917, State and Federal authority was secured to construct a higher level drawbridge and approaches across the West Waterway at West Spokane Street. Not yet being in a position to construct a permanent bridge over this waterway, the City located this one just south of the site for the permanent bridge, leaving the street right of way slightly crowded between the two drawbridges. It was a swing draw with two 115-foot spans, 36 feet above City Datum, with a net clearance of 28 feet which permitted the passing of an increased portion of the water traffic without opening the



The Third Spokane Street Drawbridge, as it appeared on April 12, 1923, just prior to the beginning of work on the first of two bascule spans which were ultimately to replace it. The second drawbridge across the Duwamish at Spokane Street carried West Seattle's water supply; each time the span was opened, these pipes had to be laboriously uncoupled at both ends, and the West Seattleites went without water until the span was back in place, the pipes recoupled to the mains, and the valves turned on—a routine that had to be repeated rather frequently, to the extreme annoyance of everybody concerned. The third bridge, which replaced the second one in mid 1917, though its roadway was a negligible four inches wider than that of the span which it replaced, at least afforded a 36-foot clearance and was not obliged to double as a water conduit. To the east as far as Beacon Hill was nothing but tide flats and trestles, the east approach to the bridge being, in fact, a long trestle; and Harbor Island—at least in its present form—was still only a gleam in the City fathers' eyes.

bridge. The roadway was still narrow, 20 feet 8 inches, with a double street car track which left the bridge at each end by separate approaches. J. A. McEachern Co. completed it May 14, 1917.

Bond issues were being submitted to the voters periodically with the intent of raising enough money to build a permanent structure over the Spokane Street Waterway. A permanent bridge was first considered in 1913, but final approval and funds were not voted until March 1924 for the steel bascule bridge to be known as West Spokane Street Bridge No. 1. There were altogether nine contracts for this bridge, for which the City's bridge

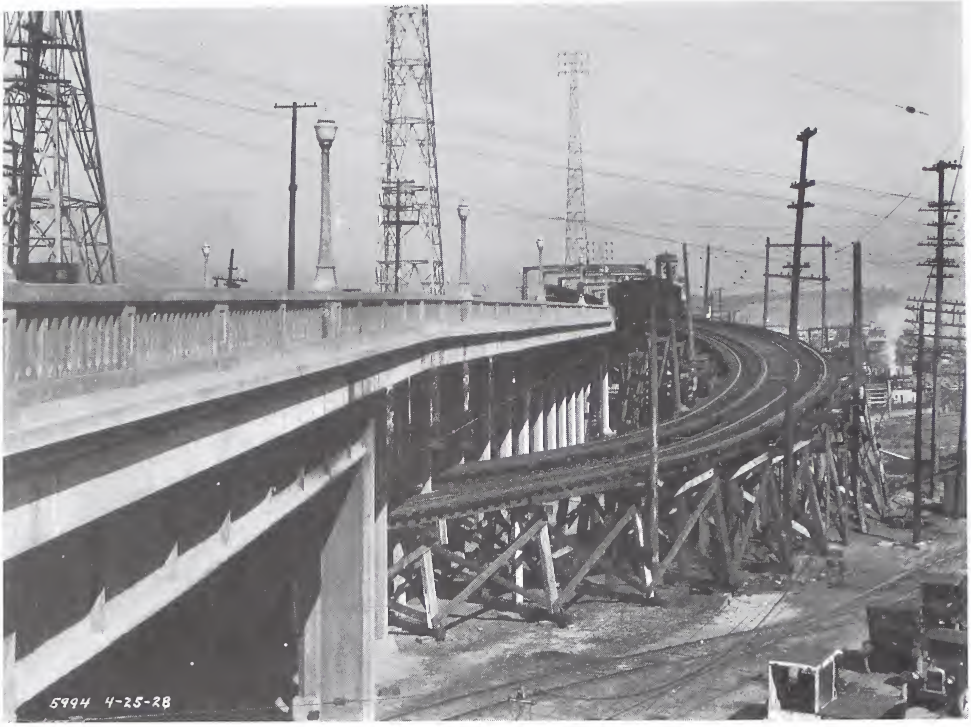


View during construction of the first, or north, Spokane Street Bascule Bridge. No less than nine contracts were required for the construction of this bridge, which was built during late 1923 and all of 1924, and opened for traffic in December of the latter year. By this time the old drawbridge had been closed to vehicle traffic and was being used exclusively by street cars to and from West Seattle; and from then until the building of the second, or south bascule span, the rapidly disintegrating timber drawbridge was a source of constant worry to the Engineering Department, a whole series of emergency appropriations from the City Council being found necessary to keep it shored and patched up.

engineer had prepared the original plans, before it was finally accepted and opened to traffic in December 1924.

Replacement of the crumbling old timber swing span was by now long overdue. Closed to vehicle traffic around 1925, and used thereafter by the Municipal Street Railway for streetcar traffic only, it continued to worry the Engineering department, as evidenced by this excerpt from the 1927 Annual Report (p. 4).

"The old frame bridge across the West Waterway used by the street car lines has given this department serious concern throughout the year. An investigation made early during the year disclosed the fact that it was unsafe, but by the expenditure of $2,500 it was anticipated that its life could be prolonged until the winter of 1928."



January 13, 1928 was the day of reckoning for the Spokane Street drawbridge. The temporary timber "shoo fly" shown here was built to route the street cars onto temporary trackage on the north bascule bridge; the permanent arrangement finally adopted utilized one rail line per bridge, the cars running to West Seattle, Burien and way points via the north span and returning on the south. This enabled the two bridges, as originally designed, to carry the additional load, and saved the expense of a third bridge for street car traffic only as originally planned by the Municipal Street Railway.

A report to the Council and Mayor on this matter resulted in repairs being made, but almost continuous repair work was thereafter needed to keep the bridge operable. A full test boring examination disclosed many weaknesses in the foundation piling and on January 13, 1928, the five o'clock traffic was rerouted. Street car passengers were required to walk across the bridge. On January 15, relaying the track approaches to connect with the bascule bridge were started and on January 21, at 5:00 A.M., street car service was resumed by way of the new bridge—West Spokane Bridge No. 1 (North).

Several designs were advanced for the second span of the West Waterway and a permit was finally secured on March 9, 1928 from the Army Engineers for the second bridge. No provision had yet been made for rail traffic, as up to this time the Municipal Railway had hoped to build its own railway bridge. Of the schemes considered, all were abandoned because of excessive cost, and because of the complexities involved, including extra clearance and counterweights.

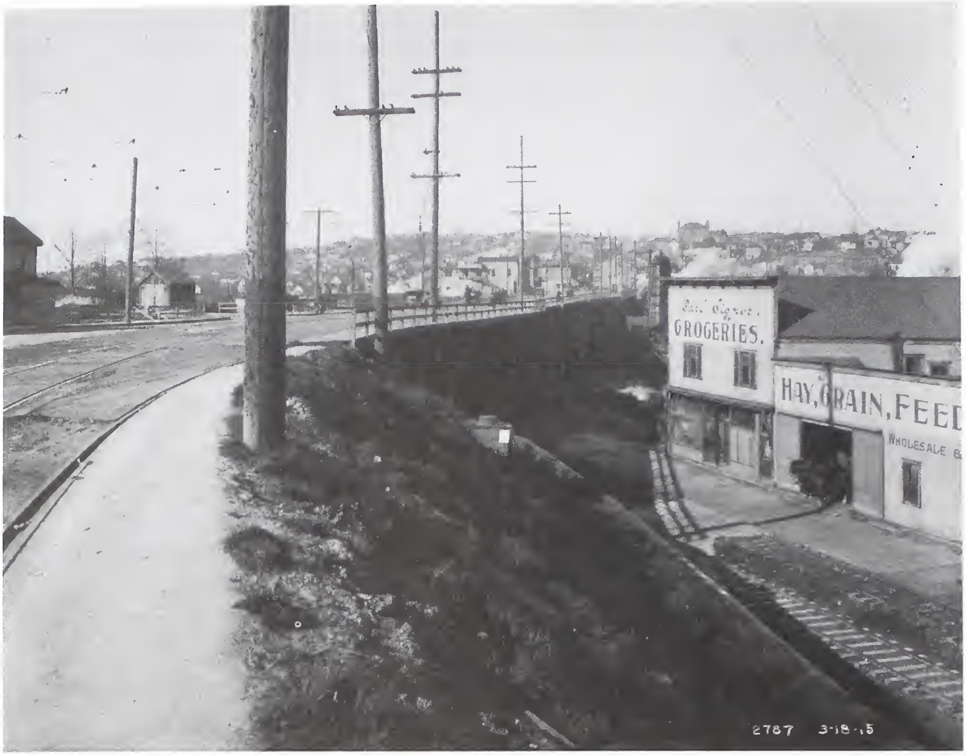
A bascule span with only one street car track on the south side of the bridge and with separate concrete approaches for the car tracks was the plan finally agreed upon. Each bridge would then have one rail line and the bascule as planned originally would be able to carry the load. Finances could be arranged, with the Municipal Railway contributing towards the trackage rather than financing an entire bridge.

The matter of paying a royalty fee of $2,000 for use of the trunnion gears patented by Von Babo, which had been used on others of the City's bascule spans, had been investigated, but both the Von Babo patent and the Strauss patent for reinforcing beams had expired before construction began. West Spokane Street Bascule Bridge No. 2 (South) was opened to traffic on September 20, 1930. Both bridges were incorporated into the City's highway complex and only the style of architecture in the superstructure of Bridge No. 1 tells that it is the older.

Three contracts for channel excavation and dredging between the proposed Locks in Salmon Bay and Lake Washington were awarded in 1911 and heed was given to the admonition that bridges across the canal would have to be installed and ready by the time the Locks were operating. The early bridges had been built close to water level; steel and masonary bridges at a higher level were now required.

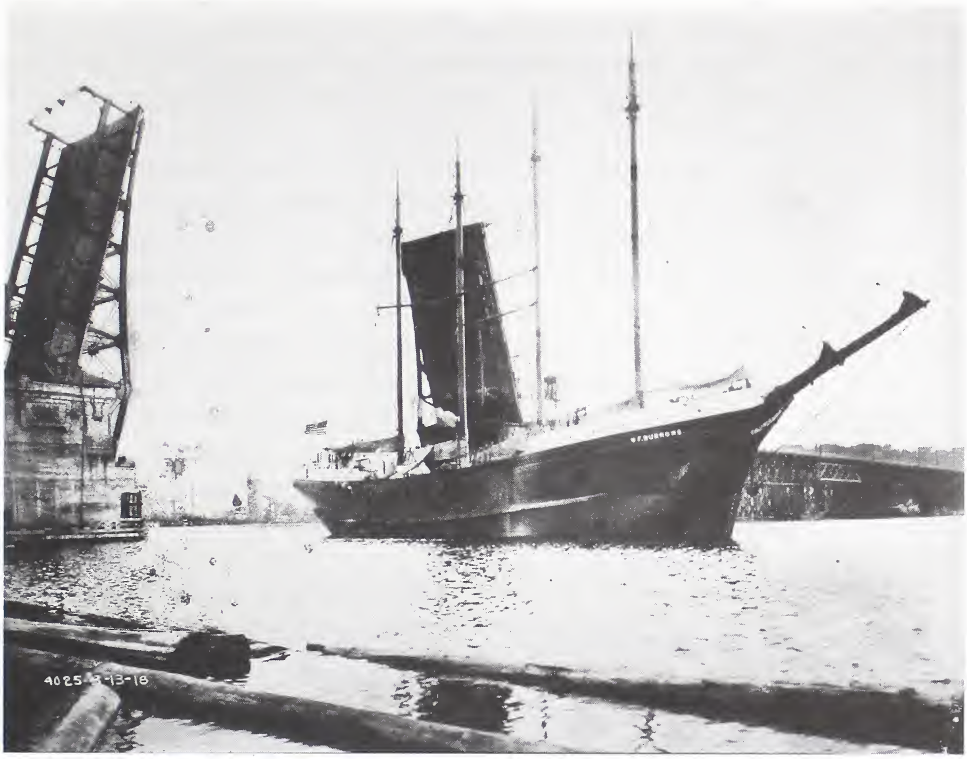
A rickety wooden structure of antediluvian ancestry originally spanned the narrow and sluggish stream that separated the community of Fremont from Seattle; most of its patrons were small boys who snared salmon from the waters below with bent pins fastened to broomsticks. In 1901 the Seattle Electric Co. built electric railway tracks across this relic to serve the Fremont and Ballard areas; and street cars, pedestrians, wagons and an occasional horseless carriage continued to pass over its decaying structure until 1911 when it was razed to make way for the widening and dredging of the channel for the new ship canal. The Stone Way Bridge, a temporary structure built on piles five blocks to the east, replaced it that same year; but a second bridge, also a temporary structure, was spanning the original gap a year later; this lasted until 1915 when work began on the Fremont Bascule Bridge, and traffic was once again rerouted to the Stoneway span. With the opening in 1917 of the new Fremont Span, the Stone Way Bridge became a picturesque memory.

Some of the concrete in the Locks had been poured to finished elevation in 1913 and the cut between Lake Washington and Lake Union was progressing. This is the part of the Lake Washington Canal often referred to as "The Cut," "Pike's Portage," or "The Portage." Three of the four main piers for the Montlake Bridge were constructed while the Portage Cut was being made on the Canal, the site being pumped dry for Federal Construc-



A rather nondescript structure was the earliest crossing of the slough which originally connected Lake Union and Salmon Bay. It was demolished in 1911 and replaced a year later by the one shown here. The photo was taken March 18, 1915, shortly before this structure, too, was dismantled, and work was begun on the Fremont Bascule Bridge. Barely visible in the extreme foreground is the new street railway trackage of the Seattle Municipal Railway's "Division A" on Dexter Avenue and Nickerson Street and, directly above it, the unique double overhead with which the system began operation.

tion, so that their extension later would be fairly simple, but there was not enough money to complete the fourth pier at this time. Canal dredging at Ross-Fremont was on a round-the-clock basis. The City had made test borings for the Sixth Avenue Northeast site only (Latona) and preliminary studies had been made for several structures, but bonds for only two were authorized in 1914. Three of the four main piers for the Montlake Bridge, Fifteenth Avenue Northwest (Ballard), Fremont and Sixth Avenue Northeast (Eastlake) Bridges are lift spans known as "Simple Trunnion Bascule," being less complicated with patents than others, and economical, reliable and efficient in operation. Bascule bridges are common in Seattle; the name in its origin means "Teeter-Totter" and applies to its way of settling into position. Their system of counterbalance and leverage enables them to remain in balance in any position. Through the years modifications have been made in various parts; one of the bridge engineers invented an auto-



The Ballard Bridge as it appeared 3–13–18 less than three months after completion, closed and opened to let through the four-master merchantman "W. F. Burrows."

matic control for the bridge opening machinery at Fremont, using a system of oil pumps. It increased the speed of opening the heavy spans by as much as 25% and eliminated some of the bump and bounce at the final seating which was more wearing on the machinery than any other part of the operation.

The bascule bridges were to provide a 150-foot width across the canal; Fremont was to be 30 feet above lake level and 15th Avenue Northwest (Ballard) was to be 45 feet above, to eliminate as many bridge openings as possible. Two lanes of traffic, two lines of street car tracks and two five-foot sidewalks were provided in the forty-foot width between the railings.

Contracts were let for substructure, superstructure, approaches and piers, in the City's prescribed manner, but one contractor on the Eastlake and Fremont bridges was unable to complete his work, so these contracts were finished by the bonding companies. In spite of this experience Fremont Bridge was completed and opened to traffic in June 1917; Ballard in December 1917; and Eastlake in 1919.

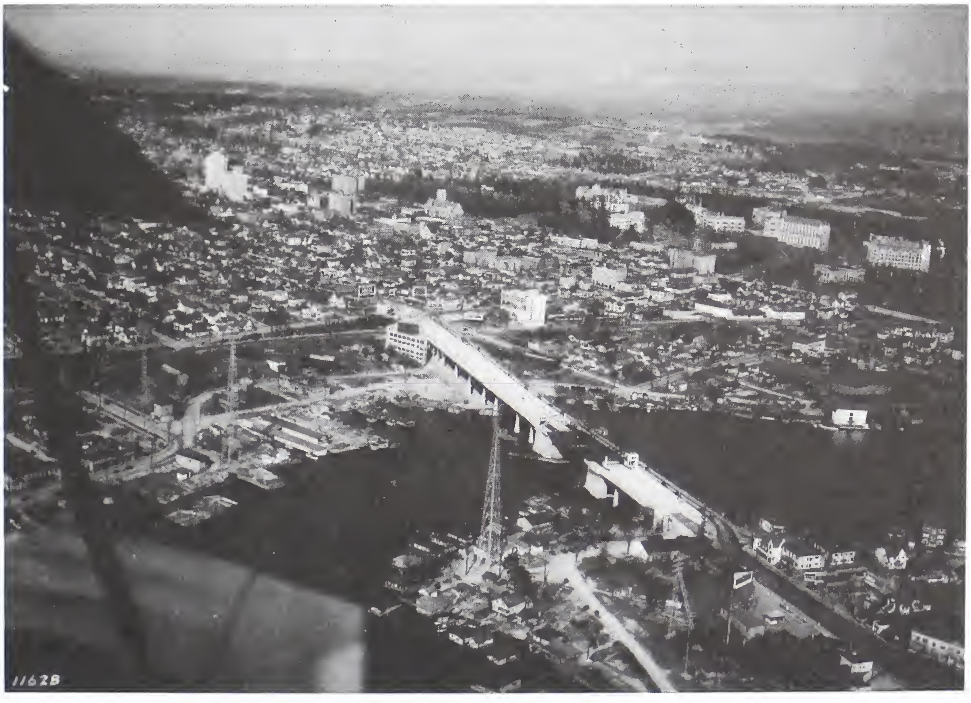
The first Latona Bridge was built in 1891 or 1892 and supplanted the row boat traffic across Lake Union. It was built by David T. Denny as part of the extension of his Rainier Power and Railway Company to what is now the University District. Originating at Third and Yesler, this line had been built as far as Harvard Ave. and Valley Street by 1892; lured by the delusive prospect of a real estate boom just north of Lake Union, Denny extended his system across the Latona Bridge and thence northerly and easterly to about N.E. 55th Street and 22nd Avenue N.E. The depression of 1893 coincided almost exactly with the completion of the line; the real estate bubble burst; and the system slid into bankruptcy which a reorganization in 1895 under the title of Third Street and Suburban did nothing to alleviate. Taken over in 1900 by the Seattle Electric Co. in the Stone-Webster consolidation of the Seattle Street Railway properties, the line continued to operate over the Latona Bridge, which was rebuilt and widened in 1902 to serve pedestrians and vehicles as well as street car traffic. In 1909 four million people crossed the lake over this bridge as they went from downtown out to the University Campus to the Alaska-Yukon-Pacific Exposition. In 1912 the bridge needed a new deck and the asphalt for the surface was furnished by the City Asphalt plant.

When the Canal and locks were being installed, it was necessary to construct a temporary movable span in the Latona Bridge until a high level bridge, required by the Government, could be constructed in the vicinity of Stoneway. A great deal of repair work was necessary on the Latona Bridge, as much dry rot was discovered. Fortunately the City had been able to purchase the steel needed for the Latona reconstruction from the original subcontractors at the bid prices; otherwise the rising prices of the First World War would have made further construction prohibitive. Even so, the failure of the original contractor and the war conditions forced the cost of the Latona structure considerably above the estimates. In 1916 there was a plea from the bridge foreman for planking and material to repair the deck and approaches "just one more time." Only the east roadway was being used and the foreman recommended that the west roadway be barricaded indefinitely should there be any more calls for repair. Latona Bridge was to be removed as soon as the contemplated high level permanent crossing at Stoneway was completed. During this period the City Engineer recommended a fourth bridge at Montlake Avenue to improve accessibility to the north end, and among the four movable span bridges thus provided, it was expected that any emergency could be met. With completion of the Ship Canal in 1918 all canal bridges had to provide for the moving of boats from Lake Washington to Elliott Bay. The first bridges had movable spans; only the George Washington Memorial Bridge, completed in 1932, at 135 feet, is high enough to permit passing of any craft that can be accommodated in the channel.

The Eastlake Avenue Bridge, which had also been known as the Tenth Avenue Northeast Bridge, had originally been opened to traffic in 1919.

Ordinance No. 39592, approved on June 30, 1919, designates "University Bridge" as its proper name. The annual report for 1923 stated that traffic over Lake Washington Ship Canal bridges had increased from 60% to 100% during the preceding three-year period, and that the trend was continuing upward. The temporary approaches on the University Bridge showed signs of deterioration before 1930 and the increasing traffic indicated that consideration should be given to repair and also to widening of the deck. Design for the Montlake Bridge, the fourth movable span across the Lake Washington Ship Canal, began in 1924, and the bridge was opened to traffic in June 1925.

By 1928, all four bridges were being used to capacity and a new high level bridge was planned at the Stone Way crossing of the Canal. This was to be built jointly by the State, County and City, with the City developing the approaches. It was to be no less than 135 feet above the surface of the water, to comply with Federal requirements. While this structure was in the planning state, repairs on the University Bridge went ahead. Permanent approaches were constructed. To accommodate the water travel through the



Reconstruction of the University Bridge occurred during 1932–3. The timber trestles were replaced with permanent approaches of concrete and steel; the wooden block paving on the deck was supplanted by the City's first application of the Irving Open Mesh steel deck; two additional lanes were constructed on the lift span, bringing the total to six; and the control towers were rebuilt. The reconstructed bridge was re-opened to traffic April 7, 1933.

canal, a temporary bascule had to be constructed. A one-way draw, lifting from only one side, was contrived from materials and machinery from different parts of the City's operations, some of it coming from the Skagit construction. It was built in an open position, and the change-over from the regular car line on the bridge was planned for the first morning run, all of the connections for the tracks and mechanisms having been moved during the night. All that had to be done was to pull the switch in the electric control house below the bridge to switch the power to the new lines. When the time came to drop the span in readiness for the first street car of the day, the crew couldn't get the mechanism to work, and was unable to find anything amiss with any of the preparations, so at about five in the morning, the supervisor finally had to be called. After inspecting the preparations, his first question was, "Have you looked in the electric control house?" The answer was "No" because it was a locked house and there had been no need for anyone to enter there. Nevertheless this was where the trouble was. An unhappy neighbor whose peace and quiet had been disturbed with all the remodeling going on over his roof, had gone over in his rowboat during the night, climbed up through the supports, and "got even with'em" by removing all the fuses and throwing them away. Fortunately the electricians were able to rig an electric connection and the span dropped into place in time for the street cars to cross on schedule.

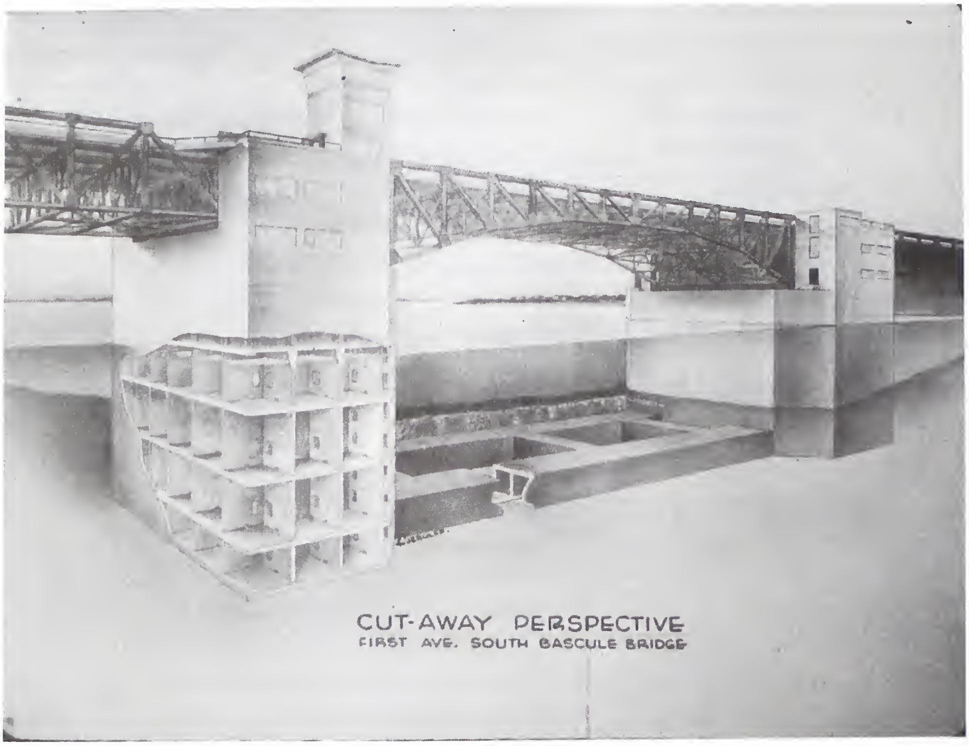
Decking for the movable spans of the University Bridge had been creosoted wood paving blocks which weighed 40 pounds to the square foot, and their slippery surfaces had been the cause of many accidents. It was here in 1933 that Seattle first used the Irving open mesh steel decking. Its weight of 22½ pounds per square foot made possible the widening of the bridge deck sufficiently to accommodate six lanes of traffic, two of them being occupied by street car tracks. The two added lanes swing around the control towers on each side of the movable span. The steel decking greatly reduced the number of accidents and has since been used on all the City's bridges. It gives better traction and stays free of ice and snow. It, too, has been improved in later years by welding to the surface the nubbs of steel that act as calks to further cut down sliding. Each bascule leaf is operated by a separate set of controls. In 1936 the 100-hp motors were replaced with 75s.

The high level crossing of Lake Union originally planned for Stone Way became a part of U. S. Highway 99 and was built as a Federal and State project. It is known commonly as "Aurora Avenue Bridge" but its official name is "George Washington Memorial Bridge," so named because it was originally scheduled to be dedicated on February 22, 1932. The Aurora Avenue site provided a more direct north-south route and firmer foundations near the lake than did the Stone Way location. The City built the approaches. An article by R. M. Murray, the State's Resident Engineer, in the Pacific Building and Engineer for July 4, 1931, gives details of the bridge and its construction. Its vital statistics are:

Roadway width	57 feet
Sidewalks (2)	5 feet each
Total width, including curbs and handrail	70 feet
Length of steel structure	2,103 feet
Length of concrete structure	842 feet
Total length	2,945 feet
Net height above water at center span	167 feet
Clearance for vessels	135 feet
Grade of roadway	2½ per cent
(73.6 feet higher at the south end)	
Opened to traffic February 27, 1932	
Dedication ceremonies were held February 27, 1932	

The first river crossing of the Duwamish River at First Avenue South was a low level swing span. The Federal permit was secured from the War Department in 1909 but it was 1911 before the bridge known as the "Oxbow Crossing" or Oxbow Bridge was completed. It was a combined project with King County, a real estate company and the City sharing the costs. Modification of the Duwamish Channel during the Waterway Project required that the bridge be changed and it was shifted in 1916 to cross the new channel. The washing of the current against the pilings and onslaughts of the teredos, even in the partly fresh water, were sources of constant trouble. Intermittent repairs and installation of machinery in 1929 kept the bridge in operating condition. Industrial development in the Duwamish area and increasing travel made a modern bridge requisite here, and in 1953 a new concept in bascule bridges was designated for this location.

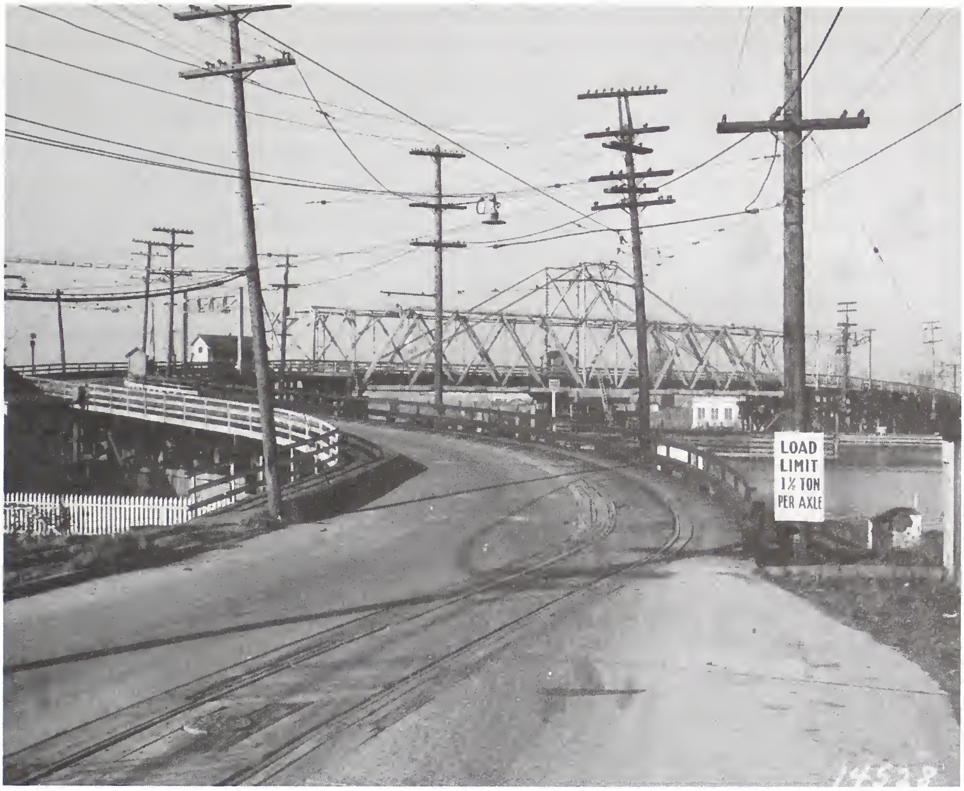
First Avenue South Bascule Bridge has semi-floating cellular piers of reinforced concrete, connected on the channel bottom by two reinforced concrete struts. Ports in the lower levels flood during the rising tide and, as the tide flows out, the impounded water drains away, thus maintaining the 85% bouyancy upon which the design is based. These floating piers supporting the bascule span over the Duwamish Waterway are credited to Bruce V. Christy, Project Engineer, and were designed by the Seattle Engineering Department and, are another "first" for Seattle, as it is believed that the principle had not been adapted in the same fashion for any other structure up to that date. This unique bridge was opened on September 22, 1956, and has become part of the State Highway system and, with a parallel bridge yet to be built, is planned to become part of the urban freeway system as it develops.



Artist's cutaway view illustrates semi-floating type of bascule piers, connected under the channel bottom by reinforced concrete, cellular struts, for the 1st Ave. S. Bridge across Duwamish River. Cutaway portion of pier shaft at left shows cells which make piers 85 per cent buoyant. Part of connecting strut near center also is cut away to show cellular design. Bids for work were called by State Highway Department. Unique new four-lane span replaces former two-lane bridge. (Sketch by Mrs. Phyllis Kjerulff for City Engineering Department.)

Another City drawbridge was built in 1914–15; it crossed the Duwamish Waterway at Eighth Avenue South. Altering the Duwamish channel required rebuilding of the piers in 1923 and ravages of the sea worms made repairs necessary in 1925. It was permanently closed July 11, 1937 when traffic patterns changed. A newspaper clipping of 1953 indicated that the bridge tender of both the First Avenue South and Eighth Avenue South bridges lived near the First Avenue South Bridge. He would close the First Avenue South Bridge after letting a ship through and then ride his bicycle along the path to the Eighth Avenue South Bridge, sometimes racing the boat.

Another day a house floated down the stream toward the First Avenue South Bridge. There was nobody aboard and no identification. The tender didn't stand on formalities but opened the bridge and let the unusual customer through. He never found out where it went, who owned it, or whence it came.



The 8th Avenue S. Bridge and its sinuous approach built originally in 1914–15, and relocated in 1923; it was closed down in July 1937 as a result of traffic pattern changes in the south end, and subsequently dismantled.

The 1956 First Avenue South Bridge is 23 feet higher than the 1911 bridge and it is not opened so many times. The tugs and barges are difficult to handle in the tidal stream and wind and current have an appreciable effect. The bridge tenders at these locations especially need a fine sense of timing to keep bridge openings as short as possible with no collisions and both land and water traffic moving with minimum delays.

In 1932 the actual total length of bridge deckings amounted to 2.31 miles. In 1956, the last report which separated bridges from interchanges, the mileage had increased to 6.20 miles. This represents only the water spanning portions of the structures.

In 1936 there were 68 temporary timber structures. Many of these were timber trestles which were gradually supplanted by fills which brought the streets up to grade and eliminated trestle maintenance. In 1959 it was reported that there were 85 fixed spans in Seattle, most of which were concrete and steel.

The following excerpt from the 1921 annual report of the erstwhile

Streets and Sewers Department helps to explain the changing yearly figures in mileages of various streets and bridges:

"Many miles of timber trestles and bridges were likewise built during the early years. In 1916, all of these except movable spans were transferred from the engineering to this department for maintenance. After they are about eight years old maintenance costs increase very rapidly. It has been our aim to eliminate such structures wherever possible. In some instances, filling and paving have replaced them. In other instances, removal and temporary grading and graveling have taken their place.

"By these methods, we have in four years removed fifteen miles of these trestle roadways, containing approximately 19,500,000 feet of lumber, 650,000 pounds of steel and 765,000 lineal feet of piling.

"In addition to these, we have in the past two years removed eighteen (18) miles of worn out planked roadways, involving 6,000,000 feet of lumber, a grand total of planking removed of thirty-three (33) miles. 25,250,000 feet of old lumber has thus been removed from our streets, the streets being paved or graveled in lieu thereof."

An increasing number of bridges and viaducts become part of the State and Federal Highway Systems and are built and maintained by the State, generally by City forces doing the work at the direction of those agencies and receiving payment therefor. Pedestrian overpasses are necessary over many of the fast-traffic highways, especially at school crossings. The overpasses are more acceptable than underpasses which were advocated at the time of the Aurora Avenue construction.

In 1936 one of the bridge engineers compiled the following information about the West Dravus Street Bridge:

"Prior to 1884, when the Seattle, Lake Shore and Eastern Railroad was built through the Interbay District, a wagon road existed on Grand Boulevard, now West Dravus Street.

"This railroad, one of Seattle's earliest enterprises, brought about grade separation on West Dravus Street, which took the form of a pile trestle with a 24-foot roadway, paved with fir plank—a structure characteristic of our early day improvement.

"In due time, the original railroad was taken over by the Northern Pacific Railroad Company, and at a later date, the Great Northern Railroad Company and Oregon and Washington Railroad and Navigation Company built their lines on parallel right of way.

"One of our early ordinances, No. 5106, approved November 18, 1898, provided that the Railroads were to build and maintain a bridge on West Dravus Street, over their right of way.

"Temporary timber structures have occupied this bridge site, having been replaced from time to time.

"During 1921 and 1922, after much correspondence between the City and the Railroad Companies, the Railroad Companies built a timber bridge with roadway 18 feet 6 inches wide and one sidewalk five feet wide. This bridge served until removed early in 1936 to make way for new and permanent construction. The new improvement, now nearing completion, is approximately 766 feet long, extending from 17th Avenue West to 20th Avenue West. The roadway width is 44 feet, and two sidewalks each are five feet wide, making a total width of 54 feet. Provision is made for a single street car track. Briefly stated, the bridge is built of steel beam on concrete piers, with reinforced concrete deck and treated timber sidewalks over the tracks of the railroads. The approaches are of concrete pavement on earth fills. The entire deck of the spans and their approaches are of concrete."

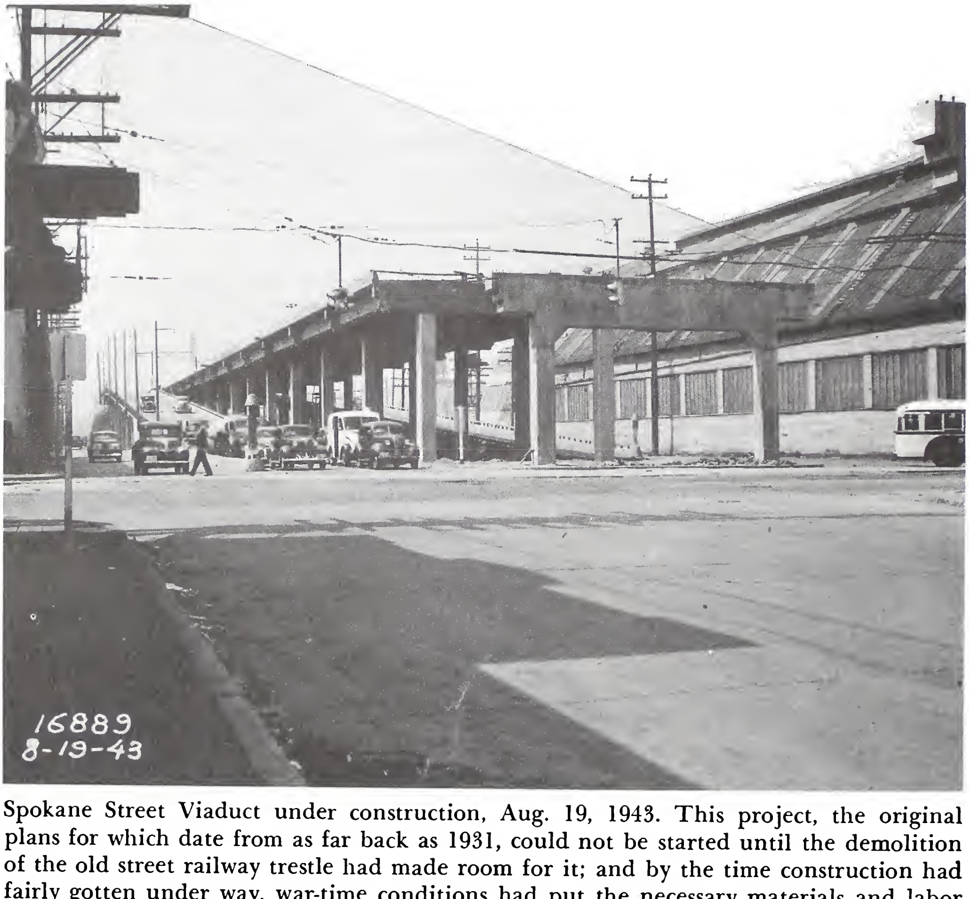
First intimations of a crossing of Lake Washington by a high-level bridge were heard in 1928. At that time even the City Engineer believed such a bridge was neither desirable nor necessary. The view of a substantial group was that the distance from the Issaquah and Lake Sammamish areas to Seward Park would not be lessened appreciably. There would never be more than the 5,000 population as the area was too remote and poor to support a larger one, and the region therefore could not possibly finance the cost of a suitable bridge. Such necessary growth in the foreseeable future was considered wildly speculative. Furthermore, it would take several years to establish the necessary fill to carry the bridge and such a fill would always be a detriment to the entire south end of the Lake and all the shore properties. It was also thought that, if such a bridge ever became necessary, it should be financed and built by the City and not by franchise petitioners. Nevertheless, on the basis of an application for a 25-year franchise made by a John Appleton, one of the City's engineers was delegated to check plans and costs for a bridge and foundation construction which was to be considered at a Council and Franchise meeting with the County Commissioners in January 1929. Nothing ever came of this; the franchise time and extension lapsed, and repeal of the ordinances was recommended.

Late in the 1930s the Lake Way Tunnels were built and the First Floating Bridge (Mercer Island Bridge) was constructed by the State as a link in the military supply line which was considered of immediate importance during the Second World War. The Lake Washington Floating Bridge was opened in 1940, and was another pioneering venture for the City and for the State in that it was the first concrete bridge to float upon pontoons anchored to the lake bottom. Proposed by Lacey V. Murrow, it was the first of its kind in the world. The fact that it was a toll bridge and paid out its construction bonds in several years less time than had been expected belied the predictions of the 1920s. The added traffic between suburbs and the construction centers in the Duwamish Industrial Complex during the war years shortened the paying-off period on the bridge.

The Floating Bridge provided a draw span for water travel on the

Lake, and has become important on the list of things to see when in Seattle. It was opened for traffic on July 2, 1940, and the country roads that penetrated the area have developed into highways serving the population and feeding the cross-state system of which the bridge forms a part. The Lake Washington and Rainier Avenue Interchange (built in 1952–3) provided connections for City traffic to the Lake Washington Tunnels and Bridge, and is an integral part of the major arterial system developing north and south through the City.

City Engineers seem to be endowed with more vision as to future requirements than there are means to develop them. As far back as 1913, consideration of a grade separation on West Spokane Street was urged. The first engineering plan and report to improve the traffic situation in this



Spokane Street Viaduct under construction, Aug. 19, 1943. This project, the original plans for which date from as far back as 1931, could not be started until the demolition of the old street railway trestle had made room for it; and by the time construction had fairly gotten under way, war-time conditions had put the necessary materials and labor at a premium. The work was done in fits and starts over the next three years, as war priorities and availability of construction materials dictated. The portion between 1st Ave. and 6th Ave. SW, shown here in this view facing west from the former thoroughfare, was completed first; the remainder, extending as far east as Airport Way, was not finished until 1944.

south end district was filed on May 31, 1931, but construction of the West Spokane Street Viaduct was not completed until the early 1940s. Again it was war industry in the early 1940s that implemented the construction and that also almost stopped it when priorities made materials nearly impossible to secure.

The viaduct carried motorized traffic over seven street or rail crossings and eleven tracks belonging to four railroads. After some redesigning and use made of materials on hand, the contractor was able to complete the west end of the Viaduct so that traffic could get from First Avenue South to Sixth Avenue Southwest. Two 22-foot roadways were finished over two streets, ramps were built at Colorado Avenue and part of the main roadway was paved. Some of the extensive excavation was backfilled and paved; safety and clearance provisions were made. The overcrossing between the Sixth Avenue Southwest and Colorado Avenue ramps was opened to traffic in 1940. The project was later given a higher priority and finished by the original contractor under a new contract at a considerable increase in cost. Financing was from Federal grade crossing funds, Federal access road funds, railroads and City and State gas tax funds.

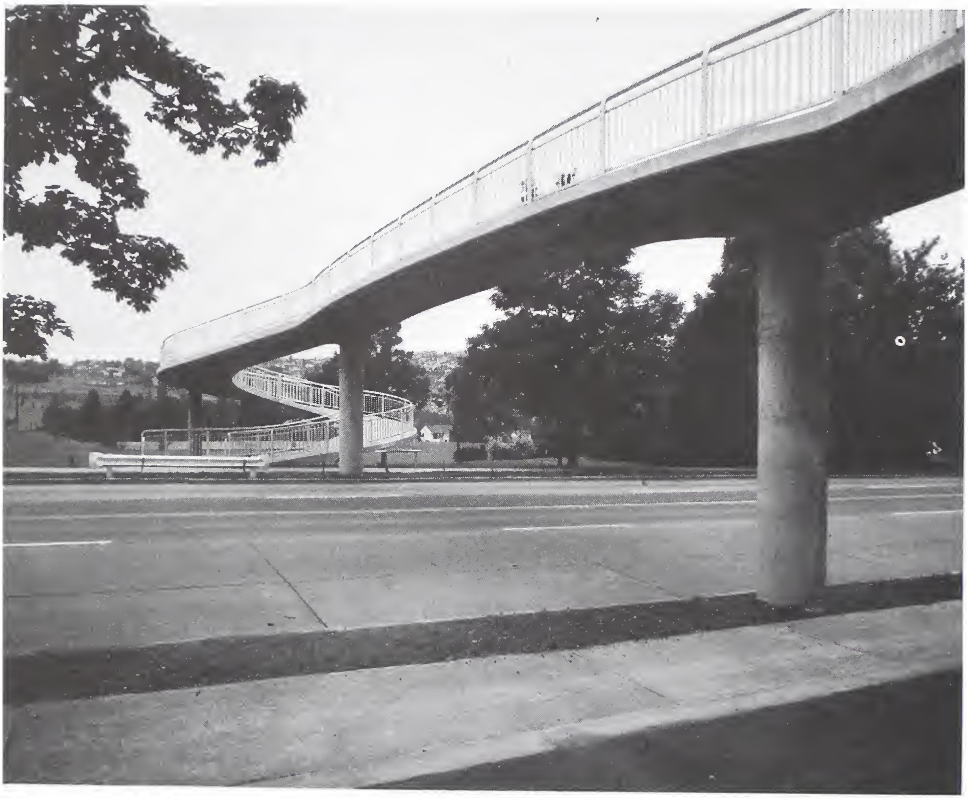
The Fourth Avenue South Viaduct and grade separation carried street

Another Depression Era bridge, the Schmitz Park Bridge, plans for which date from October 31, 1935, was built in 1936 and financed jointly by the Public Works Administration (See Ch. 12) and the State Gas Tax, the proportions contributed amounting to $47,000 and $87.266.49, respectively.

traffic south over the railroads on Fourth Avenue. It was completed in October 1934 with the aid of funds provided by the National Recovery Agency, and is an important link in the Engineering Department program of eliminating railroad grade crossings.

The number of fixed span bridges in the City varies from time to time. One of the earliest was the wooden footbridge over Schmitz Park. It was replaced by a wood pile structure around 1916 to serve traffic on the newly graded streets in the area and the increasing vehicle travel. The untreated piles lasted only about twelve years and were repaired, with a recommendation that a permanent bridge be provided.

In 1936, a concrete bridge was constructed which is of interest because of its departure from the usual. It spans the ravine at Schmitz Park on a boulevard street, with a structure that combines utilitarian design with grace and beauty, safety with serviceability. Four hollow box girders give



This pedestrian overpass, designed primarily to permit school children to cross Delridge Way on their way to and from Cooper School, just north of Oregon Street, drew paeans of praise from architects of both local and national reputation, and was proudly featured in the local newspapers, and in at least one national magazine. It was designed by consulting engineer, Bruce Christie in 1959 and built in 1960 with financing from the City Street Fund.

the impression of massive construction and greatly lessen the weight of the bridge. Walls between the legs add to the solid appearance. Reinforcing bars extend through the frames and side webs. From any vantage point this web of bridges joining the hills and crossing the water ways is a distinct part of the City's panorama.

CHAPTER 3

Waterways, Tide and Shore Lands

DEVELOPMENT of the Duwamish Valley had its start over a hundred years ago when a party of early settlers explored the possibilities of the Valley by canoe and with Indian guides. One young man named John C. Holgate spent several weeks in August and September of 1850 exploring along the east shore of Puget Sound and finally chose a site near the mouth of the Duwamish River. His affairs took him back to the Willamette Valley in Oregon, where his glowing reports induced a number of men to move this way. Returning two years later, he found that the land he had intended to take had been settled upon by Luther M. Collins. As a second choice he settled just south of what is now South Atlantic Street and about half way between the river shore and Lake Washington. John Holgate was so pleased with the country that he persuaded his mother, his brothers, his brothers-in-law, several of the Hanford families and Edmund Carr to come to the new settlement.

Floods in the early days were less frequent when the slopes were heavily timbered but as clearings and populations increased, so did flood damage.

The first law concerning drainage or flood control was passed by the Territorial Legislature in 1858. It provided that petitioners could dig ditches to drain marsh and swamp lands after securing permission from County Commissioners. By 1875 the Commissioners were required to locate the drains in relation to reports from "viewers" and also to recommend the length of ditch each benefited person was to construct and maintain.

Many times through the years the Territorial Legislature memorialized Congress for money to control both the White and Duwamish Rivers so that they would be navigable for 35 to 40 miles from Seattle. Such government assistance towards navigability was also expected to aid in relieving flood conditions.

The flood problem has plagued both King and Pierce Counties since the first settlements. The approximately 85 square mile Valley floor from Seattle to Tacoma was the normal flood plain of the White and Duwamish Rivers on the north, and of the Stuck and Puyallup Rivers on the south. The drainage basin covered 2,000 square miles and the rivers carried much silt. Frequent wintertime combinations of heavy rainfall and warm weather caused great inundations. In flood, the rivers carried immense amounts of drift and rock that literally tore at their channels and banks. The Stuck and the White flowed practically side by side for about one and a half miles not far southeasterly from Auburn. The Stuck was the portion of the White which flowed into the Puyallup and a slight rise of earth and a natural drift barrier held the main stream in its northerly course through Auburn. An old Engineering Society report says that sometimes "the loggers on the White River dammed the Stuck to secure sufficient water in the White to float their logs, and . . . others in Pierce County thought a little more water should be diverted to the Stuck to aid navigation in the Puyallup". In the November 1906 flood the drift barrier which accumulated in the north channel finally turned the White River across the neck of land and sent the entire volume down the Stuck Channel and into the Puyallup, through which channel it has continued to flow into Commencement Bay in Tacoma. The natural drift barrier between the White and Stuck Rivers was reinforced and a concrete diversion dam constructed so that no breakthrough has occurred in later years and this one great source of flood water in the White-Stuck-Puyallup Valleys has been eliminated. These installations are part of the flood control program and are known as the "Auburn Wall." The Green River flows from its source in the Cascades, past Auburn to where, in times gone by, it augmented the waters of the Black River. Until 1916, when the level of Lake Washington was lowered to that of Lake Union in conjunction with the building of the Lake Washington Ship Canal, the Black River drained Lake Washington into the Green River, flowing southerly to the southern limits of the town of Renton, and thence almost due west. Only a section of low swampy land marks the former river bed; but Black River Junction is still identified on the CMSt P. & P. RR as the junction of the east–west line with the north–south line of Union Pacific, with which it shares trackage into Seattle; the existing interlocking tower is near the site of the old river junction (¼—½ mile north). The river bears the name Duwamish from that point to its debouchment into Elliott Bay, the name being derived from an Indian word meaning "many colors"; it is affected by tides almost to Black River Junction. The Duwamish has been improved for navigation in its lower portion and is known as the Duwamish Waterway; it was organized in 1908, and the east and west waterways are its main channels into Elliott Bay. The rest of the delta has been filled to form Harbor Island and the substantial industrial area along the waterways that surround it.

In 1913 the State Legislature provided that an inter-county fund could be established by King and Pierce Counties and from it money could be spent on flood control measures in the areas where it was most needed. Through the years several studies have been made, pressures for stream control have built up and legal questions between the counties have been ironed out.

The months of November, December, January and February have been the worst for floods, and in the Duwamish Valley, abnormally high tides, occasionally coinciding with heavy rains, have added to the distress. The east side of the Green River Valley contains 87,500 acres and required some 25 miles of drainage channels before ditches and pumping stations were effective in removing the standing pools of water during the rainy season. The west side required three pumping stations and about 30 miles of channels to drain the 68,850 acres which it encompasses.

The Eagle Gorge Dam in the Green River was long considered to be the key to Seattle's industrial expansion. Howard Hanson, for whom the Eagle Gorge Dam was renamed, was an attorney who began agitating for a dam in 1889, realizing then its benefits to the Valley as a flood control measure. While the Howard Hanson and the Mud Mountain dams (the former completed on the Green River in 1962 and the latter on the White River in the 1940s) restrained the flow of the larger rivers, all the small streams ran bank full and when they reached the area of the Black and Duwamish there wasn't room between the banks to carry all the water, so that periodically the lowlands were still inundated. Overcoming these problems has been part of the work of the continuing Inter-County Fund which, since the early 1960s, has been administered solely by Pierce County.

The annual floods from the Green River and the White River continued to interfere with transportation, and by 1948, industrial development in the Duwamish Valley began to diminish. Col. Wm. H. Nelson, Court Engineer for the Engineering Department, was chairman of the Green River Flood Control Committee, composed of members from the Flood Control Section of the State Department of Conservation and Development at Olympia, the Chief Engineer of the Port of Seattle, a representative each from the King County Engineers and Seattle Chamber of Commerce. During 1948 the Committee appeared before the Board of Engineers, U. S. Army, in Washington, D. C., and were allowed one hour to present the case of the Green River Flood Control. Each speaker was questioned by the Board of Engineers which was presided over by Major General Roscoe Crawford, Deputy Chief of Engineers, who complimented the Committee on its presentation, and informed them that their arguments, exhibits and answers were most comprehensive and complete, and afforded the Board a complete background and potential value of the flood control proposal. The project was subsequently approved by the Board of Engineers and construction of the flood control dam on the Green River was authorized by the Army Engineers in 1948. The last Green River Flood occurred in November, 1959.[1]

One major effect of the flood control program has been the rapid disappearance of truck farming in the Green River Valley and its replacement by industrial plants, shopping centers and residential subdivisions. Whether this has been an unmixed blessing to the region, in view of the environmental and transportation problems that such rapid and large scale and largely unplanned developments have brought to other areas of the country in the past, is a debatable point.

Since the City is not permitted to spend tax money outside its limits, some other means had to be devised to continue the work which naturally followed the first flood control project completed by the Federal Government in the dedication of the Hanson Dam. The river continued to erode its banks in its lower reaches and the City found it more and more difficult to keep its bridge piers from being undermined. Land that should have been returning a profit was inundated periodically.

To R. H. Thomson goes credit for anticipating as early as 1908 the growth and expansion in the Duwamish Valley. He pointed out that cheap transportation was necessary to carry products, and that factories must have sufficient area for expansion. He was convinced that while the ship canal would be of benefit to the City, the more lasting good would be from improvements made along the Duwamish. He foresaw removal of the bends in the river as well as the deepening of the channel and the filling of the low shore lands. He also knew that the development would require the combined efforts of all the governing bodies in the district.

The first attempt at straightening the Duwamish was made in 1895 by the Seattle and Lake Washington Waterways Co., a group of business men headed by Eugene Semple, the last territorial governor, who contracted with the State for the privilege of dredging or excavating the waterways at the head of the harbor. With the dredged material thus obtained the adjacent 1525 acres of tidelands were to be filled.

Additional plans called for a canal through Beacon Hill to Lake Washington, going into the hill at about where Hanford Street now is; this was to be called the South Canal to distinguish it from the Lake Washington Ship Canal which was being urged for the north part of the City. There were some deterring factors to this south canal; one was that it would undoubtedly add to the flooding of the valley, and another was that canal bound and city bound traffic would interfere with each other.

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[1] Severe flooding had previously occurred in December 1933, December 1946 and February 1951.

Bids were called in 1901, to remove 5,802,000 cubic yards of earth from the Beacon Hill Ridge. This soil was to be placed on the tide land fill at the head of the bay according to specifications, and to add about 175 acres. No thought was given to the condition of the hill and consequently the disturbance of cutting the canal caused the hillside to slide. None of the surface treatments considered in those days stopped the sliding, and this was probably the major reason for the added costs of excavation and the final abandonment of the project.

The Seattle and Lake Washington Waterway Co. had elaborate financial arrangements with eastern money lenders and it also sold promissory notes to local purchasers. This money was to buy the certificates which the State issued as the work was completed. It awarded the largest dredging contract in the United States up to that time to the Bowers Dredging Company for the excavation of 35,000,000 cubic yards of earth and work began on July 29, 1895. The river was dredged to a depth of 26 feet at low tide and was 500 feet wide. For two years one and sometimes two dredges worked at the task until the company failed. The land that was filled cost between four and five thousand dollars an acre but was reported to be worth several times that amount as factory sites. About 5,700 feet of river bank was protected by a bulkhead of piling and brush. Adjacent to these new acres the Jackson Street regrade material was added, and much later still, the sanitary fills. The Northern Pacific and other railroads were anxious to make use of this built-up tide land and kept pushing their tracks farther out as the fills progressed through the years, until their present locations had been attained. Proceeds from the sale of this land to the waiting industries and railroads was expected to repay the borrowed money and also to make a profit for the company.

In 1906, the Chamber of Commerce was asked by resolution to request the return of the right of way for the South Canal to King County, and the Seattle and Lake Washington Waterway Co. appears to have withdrawn from local activities.

Commercial Waterway District No. 1 was formed by an enabling act of the 1909 Legislature to maintain and police the Duwamish River, and an active flood control program got under way. The Waterway District had no more jurisdiction in the County than did the City or the Port Commission and in 1913 the Inter-county Fund had to be authorized by the State so that King and Pierce Counties could finance relief from their river problems. The Waterway District continued its duties in connection with the lower river for 25 years after the Port District was formed. Each of the three municipal bodies, the Waterway District, the Port and the City, had its own jurisdiction and was independent of the other two. A dredge was purchased to deepen and widen the channel as far south as South 112th Street, this project continuing until after the end of the first World War; the dredged material was used to fill the marsh and tide lands. The river length was shortened to 4½ miles from its original crooked 13½ miles and the channel was deep enough to accommodate the ships that came into Elliott Bay at that time. Many of the assessments against the useable property thus created were not paid by the owners and the land reverted to King County. During the years before it became valuable to industry, the charges against it amounted to several times the original assessment until the bonds were finally called in for payment and the Waterway District was acquired by the Port Commission in 1962.

Immediately after the filling the City condemned for street purposes the rights of way of both the East and West Marginal Ways. East Marginal Way was planned 130 feet wide, parallel with the waterway and 1,200 feet from it. The space between the river and the streets was to be reserved for the railroads. The South Park people were relieved to have their lowlands built up to 2 feet above sea level, City Datum, and the developing road and river transportation and industrial sites began to show signs of fulfillment of the 1908 vision of Mr. Thomson. In 1919 maintenance of the Waterway as far south as the present location of Turning Basin No. 3 near Ninth Avenue South was taken over by the United States Government as one of its Rivers and Harbors projects.

Platting of the tide lands for both Seattle and Tacoma was progressing at the same time (1919) and another company was filling in about 150 acres of tide land in the vicinity of Smith Cove Waterway. Here it is interesting to take a look at the earlier ideas for the North Ship Canal.

The names of Lake Union and Union Bay go back to the time when they were first envisioned as the links between Lake Washington and the Sound. This scheme of cutting a channel to make a continuous waterway from the Lake to the Sound was first mentioned by Judge Thomas Mercer at a Fourth of July celebration in 1854. From that time the idea of a useable waterway was continually present in the minds and conversations of the town's citizens, and many plans of varying practicability were advanced. In 1867 the War Department gave considerable attention to the use of Lake Washington as a Naval Station, and this was one of the points used some thirty years later by Eugene Semple when he was seeking recognition for the Duwamish or South Canal. An early street platter, the Reverend George F. Whitworth, extended the streets in his plat across the muddy flats of Union Bay, believing that when the canal was dug between the lakes, the excavated earth could be used to raise his streets and fill his lots, the increased value thereof greatly off-setting the cost of the canal.

Congress was petitioned by the State in 1867 for permission to cut a small canal and to claim any shore lands thus exposed. This was opposed by the Lake Washington Canal Co., which wanted passageway for its railroad and stations and the right to dig the canal. There were other stipulations but the differences were sufficient to hold up any action on the canal; and so matters stood until the 1910–1920 period.

In 1860, Harvey Pike took his pick, shovel and wheelbarrow and went out to dig an opening between the lakes himself, but his tools were a little inadequate for the job. In 1886, a narrow waterway, which had been started in 1871, was put through between Lake Washington and Lake Union which was sufficient for use as a log chute. A second opening from Lake Union to Shilshole Bay increased by a factor of ten the size of the outlet to accommodate the added water from Lake Washington.

Again in 1897 help was sought from Congress and this time sufficient right of way was secured for the Government. Then came the years of vacillation between the Smith Cove Route and the Shilshole Bay Route. A contract to fill tide lands with Smith Cove Canal earth and a misunderstanding in the right of way agreement presented other causes for delays.

Reference has been made (Chapter 13) to the utilities tunnel at Third Avenue West and to the bridges which the government required to be built by the time the canal and locks were to be finished. In 1911 the general plans were approved by the Secretary of War and the City expected that the project would be finished in three years; however, the usual delays and procrastinations inherent in any such undertaking soon developed.[2] The small lock was finished July 30, 1916 and the large lock on August 3, 1916. Formal opening and dedication of the Hiram N. Chittenden Locks was delayed until July 4, 1917. Pictures of the early traffic show only large vessels going through the locks, with an occasional canoe or row boat. Traffic, much of which required opening of the City's movable bridges across the Ship Canal, has increased since 1917 to these proportions in 1974:

Fish Boats		9,995
Passenger Boats	Virginia V Class	1,128
Ships	NOAA Class	532
Tugs		7,741
Barges		3,841
Small Craft		61,463
Patrol Boats		678
TOTAL BOATS		85,378
Log Rafts		495[3]

Shilshole moorage has eliminated some 5,000 highway bridge openings. It also reduced lockages for pleasure craft between 1959 and 1961 by approximately 8%.

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[2] Some of these have been discussed in Chapter 2.

[3] These figures from Ship Canal Lock records by 'phone.

In 1911 the Port District was established. Its business was concerned with the development of the harbor and all interests and activities related to it. The Commissioners worked closely with R. H. Thomson who guided them in laying out the general plan for the waterfront and terminals. Early in his first years as City Engineer in the 1890s, Thomson had seen that all the wharves and piers on the east side of the harbor projecting into the Sound should extend from the southeast to the northwest. This would give vessels entering the harbor a course along a direct line from the entrance to Elliott Bay to along side each dock. George F. Cotterill, then assistant engineer and later mayor, was assigned the task of alignment of these wharves and of securing the legislative act modifying the original tide land maps of the Harbor in accordance with Thomson's views. This required nearly a year of work, with the result that all the piers and wharves now have the same alignment.

One of the first construction jobs of the new Port Commission was the Bell Street Terminal which was dedicated in 1915. It was accessible from all the railroads serving the City. It provided both dry and cold storage; the latter was just beginning to be of importance in food preservation processes. Large ships could berth at the pier, and cross-Sound boats from Vashon, Whidbey and Bainbridge Islands and from the Bremerton area could unload produce for the public markets. There were freight sheds and waiting rooms and offices; the roof, having an area of nearly an acre, was set up as a recreation and observation point. Anticipation of the opening of the Panama Canal gave rise to the hope of sending Washington apples and other produce by the shorter route to places that had been beyond the keeping life of many items. The Port was connected to the public market by the Bell Street viaduct across the railroad tracks, enabling motor and team traffic to reach all parts of the wharves and warehouses.

TIDE AND SHORE LANDS

With its long water borders and several lakes, the City has long had a great concern in all the problems relating to tide and shore lands.

Under United States laws, all navigable waters have always been and shall forever remain common highways. The beds of such navigable bodies of water are not part of the public domain and are not subject to survey and disposal by the United States. The sovereignty is in the individual states. Therefore, in the survey of the public lands all navigable bodies of water must be segregated from the public lands at mean high water elevation. This is done by running a traverse line called a "meander line," along the margin of the body of water. The meander line is not a boundary line but exists for the purpose of defining the sinuosities of the bank or shore and for ascertaining the quantity of land remaining in a particular section or subdivision thereof or in a Donation Land Claim after the segregation of the navigable water area.

Numerous decisions by the United States Supreme Court and many State Courts have held that meander lines do not constitute boundaries but are run only for the purposes set forth above, and that the line of mean high water or line of ordinary high tide, as the case may be, forms the boundary.

The "Manual of Surveying Instructions" governing the surveying of the public domain requires that in addition to navigable bodies of water, "all rivers not embraced in the class denoted as 'navigable,' the right angle width of which is 3 chains and upwards, will be meandered on both banks at the ordinary mean high water mark." All lakes having an area of 25 acres and upwards also are required to be meandered. The fact that government field notes or a plat thereof indicate that a river or lake has been meandered does not necessarily mean that such river or lake is navigable.

This variance of the meander line from the actual shore line is mentioned because it has a considerable bearing on the question of tide and shore land boundaries. Title to the beds of all navigable waters in the Territory of Washington remained in the United States from 1846 until November 11, 1889, when the President proclaimed the admission of the State of Washington into the Union. This vested the title "to the beds and shores of all navigable waters in the state up to and including the line of ordinary high tide in waters where the tide ebbs and flows, and up to and including the line of ordinary high water within the banks of all navigable rivers and lakes" in the State of Washington, except all tide and shore lands patented by the United States prior to November 11, 1889.

Navigability is a judicial question and has been the subject of a great deal of litigation and misinterpretation. The Board of State Land Commissioners of Washington, under whose authority sales of tide and shore lands are made, has in many cases erroneously assumed that, because a lake was meandered by the government surveys, it was navigable, and upon application has sold shore lands therein. This failure on the part of the State to properly interpret the question of navigability has led to litigation in which the Courts in many cases have decreed the lake non-navigable and ordered the State to refund the purchase price. Where controversy does arise over this question, it can only be determined by a court of law after a careful examination of the facts and conditions in connection with the case in point. However, the Supreme Court of the United States ruled that streams or lakes are navigable when they are used in their natural and ordinary condition as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; that navigability does not depend on the particular mode in which such use is or may be had, whether by steamboats, sailing vessels or flatboats, nor whether it is occasionally difficult to navigate, but on the fact in its natural and ordinary condition the stream affords a channel for useful commerce.

Article XV of the State Constitution provided for the establishment of "harbor lines in the navigable waters. . . ." The harbor lines so established consist of an "Outer Harbor Line" beyond which the state shall never sell or lease any rights whatever, and an "Inner Harbor Line" situated between the Outer Harbor Line and the line of ordinary high tide, the Inner Harbor Line to be within not less than 50 feet nor more than 2,000 feet of the Outer Harbor Line. The area lying between the Inner and Outer Harbor Lines, known as the "Harbor Area," is never to "be sold or granted by the state, nor its rights to control the same relinquished." This area is to "be forever reserved for landings, wharves, streets and other conveniences of navigation and commerce."

The lowering of the waters of Lake Washington by the Federal Government following construction of the Lake Washington Ship Canal raised the question as to whether the line of shore land ownership would remain at the original line of navigability or automatically extend to the new line of navigability after the waters of the Lake were lowered. The State Legislature, in order to meet this situation and similar ones that might arise in the future, passed the Act of March 25, 1913 (Chapter 183, page 667, Session Laws of 1913 which provides that "in every case where the State of Washington has heretofore sold to any purchaser from the state any second class shore land bordering upon navigable waters of this state by description wherein the water boundary of the land so purchased is not defined, such water boundary shall be held and is hereby declared to be the line of ordinary navigation in such water; and whenever such waters have heretofore been or shall hereafter be lowered by any action done or authorized either by the State of Washington or the United States, such water boundary shall thereafter be held and is hereby declared to be the line of ordinary navigation as the same shall be found in such waters after such lowering, and there is hereby declared to be the line of ordinary navigation as the same shall be found in such waters after such lowering, and there is hereby granted and confirmed to every such purchaser, his heirs and assigns, all such lands."

Lake Union has had shore line problems almost from the beginning. An early court case concerned ownership of shore lands by Brace and Hergert Mill Co. which sued the State of Washington in 1908–09, complaining that it owned the west half of Block 94 in D. T. Denny's First Addition to North Seattle and other property adjoining it at the south end of Lake Union and that it had been in possession of this property since February 26, 1903. The State alleged that the lands in question were shore lands lying below the line or ordinary high water in the bed of Lake Union, a navigable meandered lake. The State claimed that the land became its property when Washington was admitted as a state. The State had permitted the mill company to make improvements on the land and acknowledged preference right of purchase to the mill. The mill established its title and the fact that it had paid taxes on the property to the County and to the State all during its possession. The lands were shown to border on Lake Union and were part of the Donation Claims of D. T. Denny and Thomas Mercer. Lot 12 in Block 1, and Lots 1, 2, 3 and 4 in Mercer's Addition were wholly in the bed of Lake Union, below the ordinary high water mark as it existed in 1908, and the west half of Block 94 of Denny's Addition was entirely above that line. Block "A" of Denny's was partly above and partly below the high water line.

In 1908 Lake Union was two and one-quarter miles in length, north and south, and seven-eights of a mile in width. It contained about 905 acres, 499 of which were over 25 feet in depth. The maximum depth was 60 feet. Traffic on the Lake was heavy for that time, consisting of various boats, booms of logs, pilings, shingle bolts and other timber products. Some were moored awaiting various commercial procedures.

In 1852 or 1853, a dam had been built across the westerly outlet of Lake Union, causing the water to rise some 11 feet above its former level. While the dam was still standing, a meander line was run to mark the shore line of the Denny and Mercer Donation land claims. This meandered line shows the shore line to have been south of Block 94, leaving the entire property in question in this action in the bed of the lake below the line of high water mark. A second meander line, also run by the government surveyors, although it does not strictly correspond with the first, showed the same thing; but the recorded plats of Denny's Additions show the shore line passing through Block 94 somewhere near the center of the block, leaving the north half of Block 94, with the other described lands, below the line of ordinary high water. The dam mentioned went out in part some few years after its construction and was not rebuilt; in 1914 the balance of it went out, leaving the water level of the lake where it had been originally.

When the State acquired title to the shore lands at the time of its entering the Union, (November 11, 1889) many of the shore lands were occupied by various improvements, some of which served public convenience and necessity, such as wharves, docks and warehouses; some were of a strictly private nature. At that time the State gave the owners of the improvements the preference rights, extending over a period of 60 days, to purchase these improvements. The owners of the Brace & Hergert Mill did not exercise their preference right; and the contention that ownership had been acquired by use was not valid under the statute of limitations, because the mill's owners had not brought the action within the ten-year period.*

All the other arguments favoring the mill's ownership of the shore lands were legally refuted, and the shore lands remained the property of the State, to be leased or sold at its discretion. This is of interest in view of later events around the shores of Lake Union.

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* Washington Reports—49 Remington—1908 pps. 326–338.

Platted shorelands have been extended by replatting by the State Department of Natural Resources, an action which put the upland owners in the position of having to buy the abutting property in order to protect their shore land holdings. If they did not, it would be entirely possible for another purchaser to cut them off from use of their waterfront, as well as to obstruct any view that might be an attraction. This extension of shore lands into Lake Union, and consequent moving out of the pierhead lines, has happened at several locations during the years since the Brace and Hergert Mill case. The combined vigilance of the Federal Government, the State and the City may serve to prevent any further encroachment on this Lake.

CHAPTER 4

Seawalls

In 1875 the bark "Windward," wrecked on the shore of Useless Bay, Whidbey Island, was towed back to Seattle, unloaded, stripped of all gear and abandoned on the beach at about Western Avenue and Virginia Street, where fill was added intermittently until the little ship was buried. A brass plate on the protective railing of Railroad Avenue commemorates the incident.

Benezette Williams, who had been engaged to formulate plans for sewer and water systems for the City, suggested, in his 1891 report, that the tide lands south of King Street should be filled to at least 12 feet above datum. This filling was quite incidental for many years. The tide flats were a dumping place for all sorts of junk besides sawdust from the mills and ballast from the railroads.

An early profile study made in 1931 by Eldridge-Way indicates there was no fill along the central waterfront before 1904, but by 1928 a considerable portion of the tide lands had been partially filled, using the waste earth from the various regrades. Some of this fill was protected by brush and timber; some on private lands, by concrete bulkheads. In the Bogue Report[1] of 1911 there is discussion as to the method of placing a permanent fill and sea wall. The Bogue plan appears to have influenced subsequent sea wall construction and extension of the waterfront.

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[1] Plan of Seattle. Report of Virgil G. Bogue, 1911. This was an ambitious plan for what amounted to a comprehensive rebuilding of downtown Seattle. It included a civic center that would have housed all the municipal and county governmental buildings. It was worked out by Mr. Bogue in conjunction with John C. Olmstead, the famous landscape architect, and B. J. Arnold. Its rejection by the voters led to the construction of the present County Building.

A water depth of 33 feet at mean low water at the west edge of the proposed sea wall was planned. From the wall the various wharves would extend into water sufficiently deep to accommodate the ships which used them. The above mentioned 1931 profile of the streets from Bay to Madison, in anticipation of the Railroad Avenue repair, shows that the tidelands had been filled for various depths up to 40 feet at Madison Street, so that a partial foundation for Railroad Avenue was already laid. The plank and trestle roadway that had served since the time of the fire in 1889 was demanding extensive rehabilitation.

R. H. Thomson's plan had been more far-reaching. In 1909 he anticipated that a sea wall would be built at the outer or westerly side of Railroad Avenue (Alaskan Way), and he suggested the westerly extension of the waterfront, supported by a massive fill from Connecticut Street to Garfield Street at Smith Cove. This would provide room for two streets west of Railroad Avenue. The fill would be supported on the outer boundary by a rock and concrete wall, and the piers would extend further into deeper water. His plan would have added width to the City along several miles of the waterfront, but for obscure reasons it was never pursued.

The railroads had been making use of the land filled by the dredging activities of the Seattle and Lake Washington Waterway Co., and by the regrading of Jackson Street, as it had become available, for their right of way; and the switching yards and tracks began to make a confusing maze at the City's doorstep. Railroad Avenue as it progressed north along the waterfront was built on pilings driven through the fill; spur tracks crossed to the businesses and wharves that also developed on pilings on the westerly side.

When it came to actual construction of road bed, the railroads were forced to drive piling much deeper than the original ones, to gain support for the heavier equipment. The first tracks had begun to settle and it was found that the "hardpan" was only a layer of compressed material that gave way gradually to the increasing loads. It was another 40 feet, more or less, down to the true hardpan.

The railroad franchise story is a long and complex, not to say controversial, one, and far too involved to be retold in any detail in a history of the Seattle Engineering Department;[2] only the barest outlines of it will therefore be given here. During the 1870s, when Seattle, following on the rebuff which the Northern Pacific had given it in 1873 by choosing Commencement Bay as its terminus, began, with more energy than foresight, to build its own projected transcontinental road, the Seattle and Walla Walla, various property owners along the front of Elliott Bay were induced to donate portions of their lands for right of way to a proposed waterfront terminal. The result was a narrow strip that hugged the jagged shoreline and became known for this reason as the "Ram's Horn."

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[2] The most detailed and scholarly treatment of the Railway issue as it affected Seattle is in Robert C. Nesbit, *"He Built Seattle"; A Biography of Judge Thomas Burke* (U. of W. Press, 1961). *Bagley's History of Seattle* and *History of King County* contain good general accounts of railway developments in Seattle; for the early history of the Seattle and Walla Walla, and of its corporate successors, the Columbia and Puget Sound and the Pacific Coast RR., Gerald Best, *Ships and Narrow Gauge Rails* (Howell North, 1964) may be consulted.

The depression of the middle 1870s having effectively squelched the little Seattle and Walla Walla's transcontinental ambitions and relegated it to the status of a local system extending to Renton, Newcastle and (eventually) Black Diamond, the right of way issue lay dormant until James J. Hill announced his plans to bring his Great Northern to Seattle. With the waterfront the only right of way available, and with the "Ram's Horn" already occupying most of it, the problem of establishing a suitable route into the city as an inducement for Hill to make Seattle the terminus of his system was boldly solved by laying out Railroad Avenue 150 to 180 feet wide, with its eastern boundary lying outside of the high tide line, thus putting the entire right of way in the water.[3] Edward Hanford and Thomas Burke were the instigators of this audacious move; the latter in particular carrying on the fight on behalf of Hill and against the Northern Pacific which, true to the precedent it had established during the years since 1873, did everything in its power to block the Great Northern's plans for Seattle. In 1893, shortly after the Great Northern had entered Seattle, Hill asked for a franchise to operate his trains through the city as part of his plans to build north ultimately to Vancouver via the subsidiary Seattle and Montana. City Engineer R. H. Thomson refused this request on the grounds that the network of tracks and crossings would cut the waterfront from the business district and retard development; it would permanently fix the grades of the manufacturing district at elevations too low for proper sewerage and the necessary terminals across the streets would add to the break across the waterfront. Another objection was that the smoke from the trains and manufacturing would be a continuing nuisance in homes and offices.

A protracted three-way fight thereupon commenced between Hill, Burke and Hanford on behalf of the Great Northern, City Engineer Thomson on behalf of Seattle, and Northern Pacific on its own behalf. By 1899, however, the Northern Pacific had given up its prolonged battle to frustrate Seattle's transcontinental railway aspirations; wishing now to get a portion of the revenue that was flowing into the Great Northern's coffers as a result of its Seattle connection, Northern Pacific's President Charles Mellen petitioned the city to build a major terminal and freight yard on Railroad Avenue. Inasmuch as this plan would have effectively and permanently blocked off the city from access to Elliott Bay, the erstwhile antagonists, Judge Burke, still representing the Hill interests, and City Engineer Thomson, joined forces and succeeded, after a bitter and hard-fought controversy, in defeating the Northern Pacific proposal. An agreement was finally reached between the contending parties in 1900; it provided for a Union Station at the south end of the city, with a tunnel underneath for all through railroad traffic. Yard facilities were to be designed and located so as not to interfere with the east-west traffic and business, and the waterfront would be open to the city.

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[3] Railroad Avenue was established in 1887 by Ordinance 804. The original of this ordinance was among those documents lost in the 1889 fire.

The railroad tunnel's south portal is at Washington Street between Third and Fourth Avenues. Its route is under Fourth Avenue to Spring Street where it curves westerly until it meets Alaskan Way just north of Stewart Street. One of the Alaskan Way Viaduct piers installed in 1952 shares a foundation footing belonging to the tunnel, which was completed in 1905.

Construction next began on the King Street Station. Earlier trains had used a terminal at the foot of Columbia Street; the first one going east via the Great Northern route left the City at 8:15 A.M. on June 18, 1893. This was Seattle's first direct connection with the East. Previously the City had been at the end of a spur track from Tacoma. Jim Hill believed that rail and water traffic must be joined to enable Seattle to take greatest advantage of its port facilities and to be able to compete with the other areas. He was influential in arranging for the Japanese Nippon lines to come here in 1895. He gave local lumbermen a freight rate on their timber of 40 cents per hundred when other areas were paying 90 cents, arguing that western timber couldn't compete over the long distances otherwise, and it was better for him to carry loads than to run empty cars.

The temporary planked roadway on Railroad Avenue was continually in need of repair. Virgil Bogue, in his 1911 report, considered the harbor to be our greatest commercial asset, and regarded any improvement there as a good investment. By 1912, the railroads were contemplating filling in Railroad Avenue between Broad Street and Pike Street and it appeared advisable for the City to devise some means of protecting the fill on the west side of the Avenue. The City could then look forward to paving the street as soon as the fill had settled. The City Engineer believed that this would be a great advantage to traffic and would present a much better appearance to those entering the City by water.

But money was scarce; repairs continued to be made only when absolutely necessary, and the asphalt paving over the planks continued to give way.

In 1920 a levy of $200,000 was made as a beginning on the project of improving the waterfront street between Madison and Pike Streets, and the 1927 annual report mentions that studies were being made for the Railroad Avenue-Armory Way project which would give the north business district better access to the waterfront.[4] It served to stir up publicity again and brought out the fact that the appropriation of 1920 had been channeled into the General Fund where it had achieved the status of a budget saving.

Early in the 1920s the proposed cutting down of Denny Hill stirred thoughts of using the earth to advantage by carrying out the filling of Railroad Avenue at the same time. Need for the retaining wall to extend from Pike Street to Yesler Way was expressed. It was also obvious that Aurora Avenue would be reached via Seventh Avenue and that cross streets would be widened between it and the waterfront. The Armory Way condemnations for right of way were beginning to fit into the emerging street pattern, but nothing further developed for several years, until the Elridge-Way* report of 1931 was prepared. The State Emergency Relief Fund granted $396,000 to continue a portion of the project in 1933. Correspondence in the Central File records and annual reports supplies information concerning the preparation for construction of Railroad Avenue.

A complete story of the Seawall was published in 1934 and the following pages are "Reprinted from Engineering News-Record, November 8, 1934, copyright, McGraw-Hill, Inc. All rights reserved.":—

[4] Most of Armory Way is now Western Avenue.

* W. Floyd Way, Consulting Engineer.

ENGINEERING NEWS-RECORD

November 8, 1934

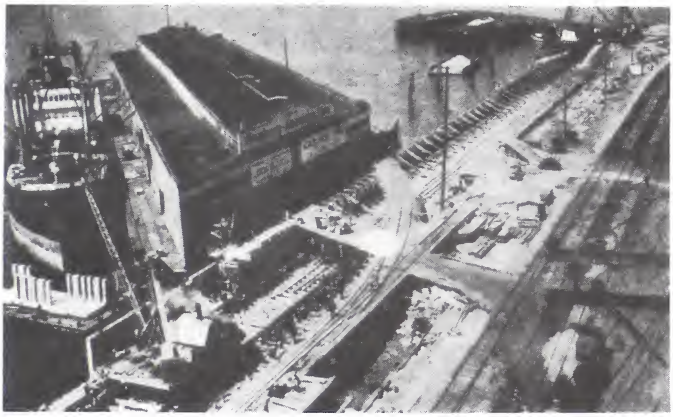


FIG. 1—MODERNIZING the Seattle harbor front with a seawall of precast concrete slabs. A pile-supported relieving platform carries the fill on which the railroad tracks are rebuilt.

Seawall of Novel Design for Seattle Waterfront

Important municipal improvement on Railroad Ave. has facing of precast concrete slabs with sheetpiling cutoff beneath—Heavy thrust transmitted to timber caps—Railroad tracks supported on fill over relieving platform

RAILROAD AVE., the principal waterfront street in Seattle, provides both rail and vehicular access to piers and the adjoining wholesale business district. Railroads entering the city from the north originally built their main lines along the waterfront and still retain freight-service connections within the boundaries of Railroad Ave., which is 150 ft. wide. Beneath the street level and along the pile trestles that carry street traffic and tracks over the beach areas there has been gradual filling in of sawmill refuse, broken concrete and driftwood. The need for a modern type of seawall construction along this harbor front thoroughfare has been recognized as a desirable improvement for more than twenty years; a deterrent factor has been the high cost entailed by the physical problems of soft bottom and a 16-ft. tide range, with the attendant marine-borer menace to timber construction.

In 1929 new franchise agreements with the railroad companies restricted through trackage to the easterly side of the street, leaving only spur connections to the piers across the main roadway, and marked the start of a definite solution of the unusual problem. A novel design for a seawall developed to fit Railroad Ave. requirements was finally adopted, and late last year funds were made available. Construction, in accordance with the design described in the following, now is well under way.

FOR MANY YEARS Seattle has recognized the need for improving its main harbor front thoroughfare. Railroad Ave. has been a confusion of railroad tracks and trucking area supported on timber-trestle construction, and the transfer facilities between the pier sheds and the wholesale district have been seriously hampered. No temporary expedient was feasible, and a major reconstruction program on this waterfront, with its soft foundation and 16-ft. tide range, was essential to modernize the harbor line, which is one of the most important assets of the city. For several years the project was delayed because of financing problems, which included the allocating of costs among railroads, special assessment districts and general city obligations. These problems have been settled, and the work is now well under way. This article describes the general design and construction features of the work, and the succeeding article reviews the details of the important work of precasting the concrete slabs that are exposed to sea water. —EDITOR.

Primary objectives of the design were to take care of a heavy horizontal thrust figured at 12,000 lb. per lin.-ft.

of all for one type of design and 38,000 lb. per lin.-ft. for two other designs, without making use of a gravity-section retaining wall, which, if built on piles driven into the soft subsoil along the shore, might be in danger of moving off into deep water. It was highly desirable to have the upper part of the construction in the form of earthfill to facilitate changes in spur-track locations, which doubtless will become necessary as future improvements are made in track facilities to and on the piers.

These objectives were accomplished by a design that includes: (1) steel sheetpiling along the line of the wall face; (2) vertical and batter timber bearing piles behind this sheetpiling to support a timber relieving platform; (3) precast concrete slabs on the water edge of this platform, set vertically to form the face of the seawall, the slabs making a tight connection with the sheet piling by means of concrete placed around the joint; and (4) a means for anchoring these precast slabs by bonding them at the level of the center of thrust to timber caps extending back in the relieving platform to connect with the pile heads, these caps to transmit into the piles the horizontal thrust for which the seawall is designed. Obviously, these requirements called for a precast slab of unusual form, as well as novel features in the connections between steel and concrete and the concrete and timber.

Because of the difficulty experienced by contractors in disposing of local improvement district bonds offered in partial payment for the work, also because of wide differences of opinion as to the cost and feasibility of successfully carrying out the novel design, there was much delay between completion of plans and start of the work. Bids on the job as a whole were invited several times without attracting a single tender. It became apparent, therefore, that if the construction were to be undertaken, it would have to be handled by the city itself on its own financial, engineering and construction responsibility. The city then assumed the function of general contractor and let subcontracts for parts of the work that were readily handled separately. The first slab was placed May 16, 1934, and on Sept. 1 slabs making up a length of 1,746 ft. of the seawall were in place.

Project as a whole

The seawall's total length of about 6,100 ft. is made up of three variations of the general design, designated A, B and C. About 5,000 ft. of type A design (Fig. 3) will be used along the beach where the ground line does not go below El. -15. For this part of the work the precast concrete slabs have a section resembling the letter T lying on its side. The B type, designed for a steeper beach slope where the ground level varies from El. -20 to El. -40, has an L-shaped section (detail on Fig. 4); about 800 ft. of

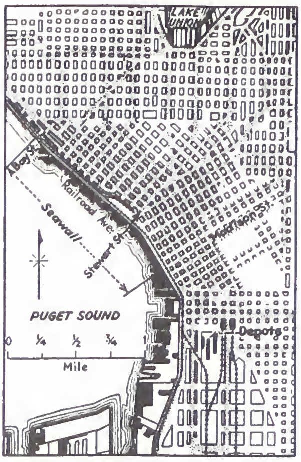


FIG. 2—SEAWALL LOCATION with respect to the principal harbor-front and business section of Seattle.

this type will be required. The C type, of which there is only about 300 lin.-ft., also makes use of the L-shaped slabs but has, in addition to batter piles driven with forward slope, an auxiliary system of batter piles with backward slope. By means of hooped connections over the timber ties in the relieving platform, these batter piles are to resist overturning moment in the wall itself by carrying a tension load.

All three types have the same design in timbers and flooring, which constitute the relieving platform, the differences being chiefly in the shape of the concrete slabs, the height of sheetpiling, the use of wooden batter piles under the platform, and the concrete protection of sheetpiling required for B and C types. In these two types the steel sheetpiling comes up nearly to the level of the relieving platform and would be exposed to tidal action if unprotected. The change from B to the C type is made where the water depth and beach slope are such that the compression batter piles cannot be counted on to carry the overturning moment with sufficient margin.

Piles and relieving platform

The plan for types A and B is to use piles just long enough to penetrate the mud and debris on the beach and enter a layer of compacted sand and gravel, which usually occurs at El. -35 to -40. However, for that part of the wall where Type C design is used, this compacted layer was found to be only 4 or 5 ft. thick, and below it lay some 40 or 50 ft. of fine sand and fresh water highly deficient in supporting power. The risk of breaking this crust over the fine material by the deposition of a considerable weight led to the decision to use longer piles and to go through to a firm layer below. Accordingly, piles that occasionally exceed 110 ft. in length are used here. This form of support was found cheaper than a design using 130-ft. steel cylinders of corresponding load capacity, as at first proposed.

The total width of the relieving platform for the A-type construction is 47

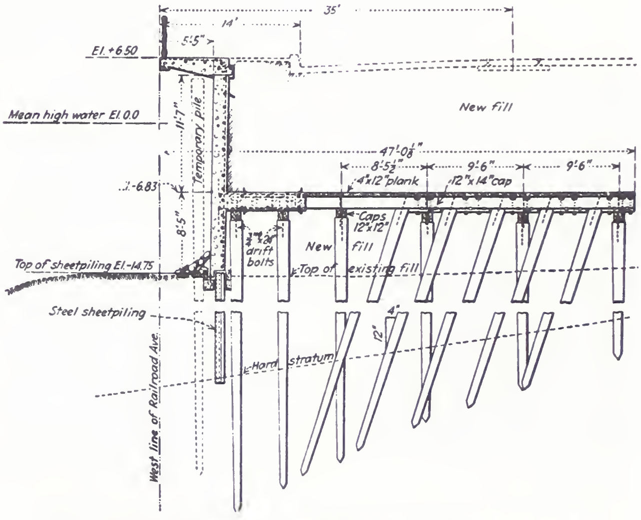


FIG. 3—TYPICAL SECTION through seawall showing pile supports, precast concrete slabs and new fill area. This type A section was used for about 5,000 ft. out of the 6,100-ft. total length. The slab for type B section is shown in Fig. 4, and type C is characterized by extra long piling battered in both directions.

ft. (Fig. 3); inshore from this an ordinary fill will be used. Calculation of the horizontal thrust was based on four components: (1) a surcharge loading of 500 lb. per sq.ft. above the roadway surface; (2) 9 ft. of sandfill with an angle of repose of 2:1; (3) 14 ft. of saturated fill weighing 112 lb. per cu.ft. with a 3:1 angle of repose; and (4) a submerged fill weighing 70 lb. per cu.ft. with a 3:1 angle of repose. From these four the total horizontal thrust against the seawall was calcuated as 12,000 lb. per lin.-ft. of wall.

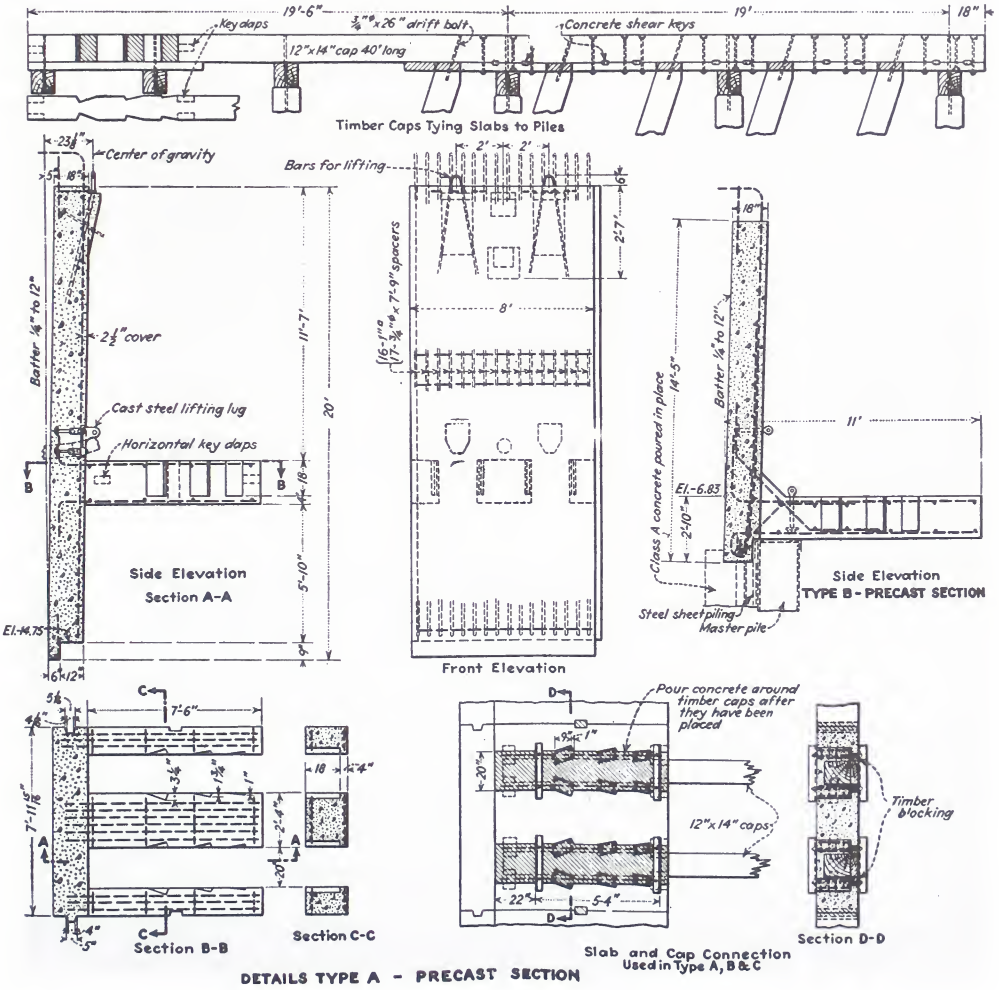
On this basis the thrust against an 8-ft. length of the seawall (the precast slabs are of this width) would be 96,000 lb. The design of the slabs was worked out to transfer this thrust into tension to be taken by two 12x14-in. timbers 40 ft. long whose ends would be notched and embedded in the concrete of the horizontal leg of the slab (Fig. 4).

In the case of some of the B and C-type sections of the wall, the horizontal thrust is calculated to be as much as 38,000 lb. per lin.-ft., because of the increased depth of the water on the seaward side. To provide a sufficient anchorage to allow for possible future dredging in front and future strengthening of type A wall, the notches in all timbers were cut large enough to carry this greater load. The notching was arranged to transmit the total load to the timbers without developing excessive stress in the timbers, either in shear or in tension.

In the slabs of the type A wall, the joint between concrete and the steel sheetpiling is made by building up a timber form around the top of the sheeting, in which concrete can be placed (using tremies when necessary) either just before or after setting the slab. The weight of the precast slab is carried entirely by the timber piling and caps of the relieving platform, which engage the under side of the horizontal leg of the slabs.

The steel sheetpiling, driven after the relieving platform has provided convenient support for the driver, varies in length from 15 to 60 ft. Its function is to retain the soft material underlying the old beach and the new filling material up to the bottom of the relieving platform, so that there will be no seaward movement of underlying material

FIG. 4—SLAB DETAILS of type A wall slabs, timber caps and method of connection. A section of the type B slab is shown to indicate the difference in design.



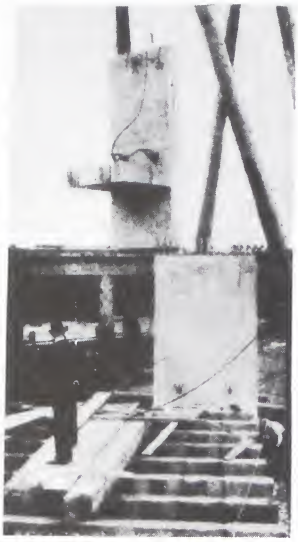


FIG. 5—PLACING SLABS with lines attached to loops of reinforcing steel in upper edge. Note slack lines attached to lugs at horizontal center of gravity, used for picking up.

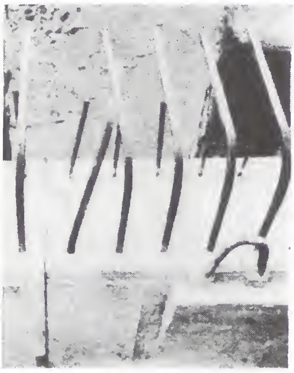


FIG. 6—SLAB JOINT visible at top of wall. U-bolts used for vertical lifts are shown. Projecting reinforcing will support sidewalks to be cast in place.

with the consequent possibility of exposure of the untreated timberwork to attack by marine borers.

Under types B and C walls it is necessary to retain a considerable depth of fill, and the sheetpiling is reinforced with master piles consisting of 22-in. beams of the proper weight to withstand the bending moments developed at the various points.

The relieving platform, complete with its supports and the notched timber caps, is in place before the concrete slabs are set. The timber caps, which are drift-bolted to the tops of the bearing piles, have to be in exact position both as to line and grade because they fit into openings left in the horizontal leg of the precast concrete slabs. On the other hand, the piles that support the caps cannot be exactly placed because of irregularities and deflections that result from driving through old fills containing numerous obstructions. Therefore, the piles are driven as accurately as is consistent with reasonable speed, and after they are cut off to exact grade a survey of their locations is made with a transit. Based on this survey, each cap is framed and marked for a particular location. Where pile heads are off-center sufficiently to warrant such treatment, a short length of 4x12-in. timber is bolted to the side of the cap to widen it where the pile is out of line, affording a full bearing despite the misalignment.

Four-inch timber blocks bolted to the under side of the caps are placed to fit exactly behind the tops of the batter piles. Thus, when the cap is laid down upon the pile tops, every pile, whether vertical or battered, comes into bearing. In addition to the bolts put through these scabs on side and bottom of the caps, sliding movement between scab and timber is resisted further by keys of cement mortar.

When the caps are in place with full bearings on both the vertical and the batter piles, and bolted fast, the structure is ready for the precast slabs. The slabs are brought to the job by rail or barge, loaded face down. Two sets of pick-up bolts are provided on each slab—i.e., one set over the center of gravity when the slab is lying on its face and another over the center of gravity when the slab hangs vertically.

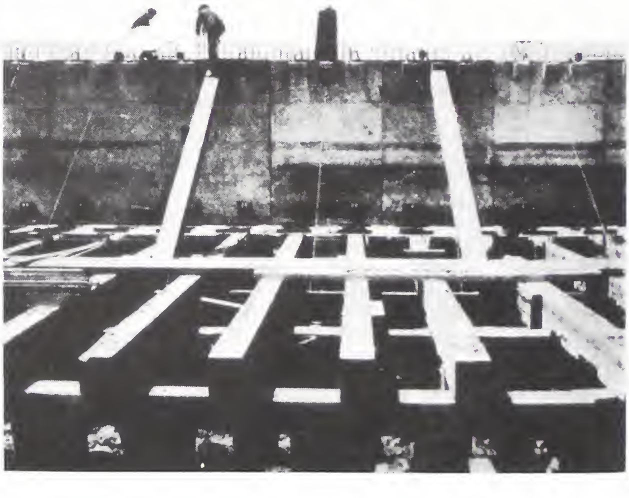
Picked up from the barge by an A-frame derrick, using one set of pick-up bolts, the slab is swung into position over the wall; support is transferred to the other bolts (Fig. 5) by tightening up on cables to the second pair of connections, and the slab is lowered vertically into place. The bolts used for lifting it from the horizontal position are temporary fastenings bolted into a recess in the slab left for this purpose. These bolts are removed after the section is in place and are used again. The points of attachment for the vertical position are U-bolts permanently embedded in the top of the slab.

After each slab is set in the fresh concrete over the sheetpiling, the slab is braced by steel tierod or inclined timber strut (Fig. 7, to hold it in alignment. A rich cement mortar is then placed in the notched space between the heads of the timber caps and the sides of the space provided in the precast slabs. The vertical joint between the slabs (Fig. 6) has been so tight that it has not been necessary to seal at the back as had been planned.

The final step in making the slabs into a continuous seawall is the pouring of the cantilever sidewalk carried on reinforcing bars left extending from the slabs for this purpose. This is not done, however, until several hundred feet of wall are completed and the fill has been placed, so that any small movements attendant upon the filling operations will have occurred.

Material for filling both above and below the relieving platform is delivered on barges and unloaded by grab buckets that dump onto the platform. Alternate planks of this platform are omitted to facilitate getting the fill material beneath

FIG. 7—SLABS IN PLACE, viewed from the land side. The inclined timbers and tierods are removed after the concrete around the timber caps has set. Note the timber scabs over misaligned piles.



it, and sluicing jets are used to aid in the placement. Material is worked into the space just behind the concrete slabs and beneath their horizontal portion by jetting down through 4x6-in. holes left at 8-ft. intervals at about the center of the slab, and 4x12-in. holes left at about 4-ft. intervals immediately opposite the ends of the timber shear caps.

The estimated total cost of the Railroad Ave. improvement is $1,396,000, and construction is expected to require about two years. Principal contractors, all Seattle firms, are as follows: Driving timber piles, Manson Construction and Engineering Co.; furnishing precast concrete sections, General Construction Co.; placing concrete sections, Hagman & Larsen, Inc.; placing filling material, Western Construction Co.

The work is being done according to designs developed by Clark H. Eldridge, city bridge engineer, who is in direct charge of the work. R. R. Hubbard is resident engineer on the job, and Thomas R. Beeman is city engineer. W. F. Way, as consulting engineer, reviewed the design.

Precast Slabs of Dense Concrete for Harbor Seawall

Concrete for Seattle waterfront improvement shows strength as high as 7,800 lb. per sq. in.—Slabs cast face downward and vibrated thoroughly

In the precast slabs for the Railroad Ave., seawall in Seattle, one of the principal requirements was to secure concrete that would be highly resistant to salt water, particularly on the face exposed to constant tidal action. The slabs are 18 in. thick, and each has a 12x20-ft. face exposed to seawater. Their design was purposely worked out so that the effective location for the steel reinforcing would be toward the rear of the slab, giving a maximum concrete cover between steel and seawater. The slab-construction plan provides for pouring the slabs in a casting yard with the face downward, so that gravity and vibration can be combined to bring cement to the front surface and secure maximum density there. General features of the design and plan of constructing the seawall are described in the preceding article.

A section through the seawall shows the precast slabs of type A construction in the shape of a letter T lying on its side—that is, with the top of the T in the vertical plane where tidal action occurs. The casting is done, however, with the T in an inverted position and with the bottom of the form against the face of the slab that will be exposed to seawater. For part of the work in which an I-shaped section is used the same general casting plan is followed. Sections, heavily reinforced with 1¼-in. deformed squares, weigh about 24 tons for type A, 21 tons for B and 29 tons for type C.

To keep up with the programmed construction schedule, it was necessary to plan a casting yard with a capacity of about six slabs per day. The site for the yard was selected near the west waterway in the south part of Seattle, where there is ample space for materials storage and convenient spur tracks. Foundation for the casting bed consists of a concrete slab 5 in. thick and about 180 ft. long. On this slab was laid a 2-in. plank floor to provide a bed convenient for fastening down metal facing for forms. Over this timber flooring was placed a layer of 18-gage steel, fastened down with countersunk screws.

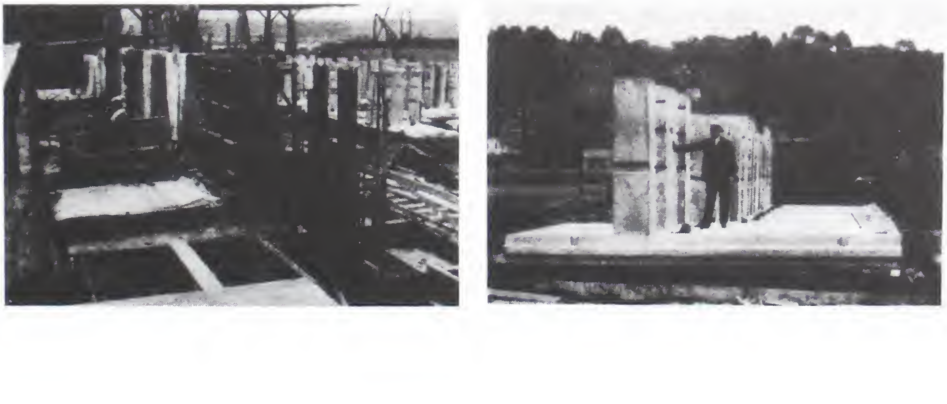
For each slab a box-like frame, rigidly bolted together and faced with metal lining, is placed on the steel bed-sheet. Within this form the steel reinforcing is assembled in place, wired together for support and held in place partly by the timber form for the portion of the slab that is cast upright. Much of the weight of reinforcing in this upright part is carried by hooks slung from the top of the heavy timbers of the form. Steel in the horizontal part of the slab is suspended from short pieces of old rail laid across the form.

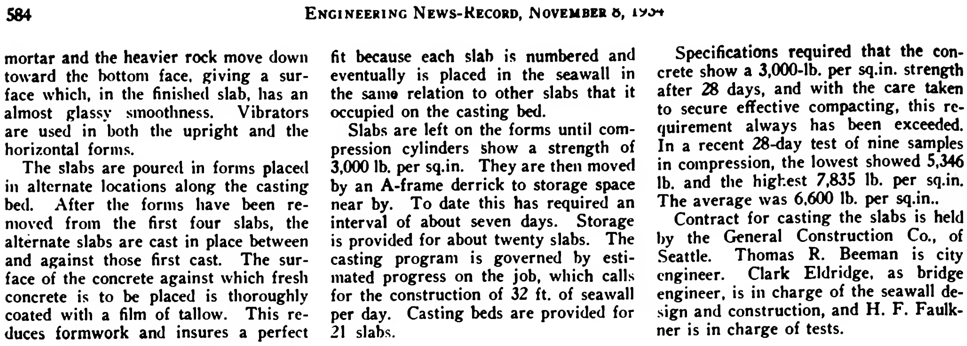
The forms are lined up by transit, and the upright leg is supported rigidly by two braces made of 3-in. pipe with the ends flattened to afford convenient means of bolting in place. The forms are of the panel type bolted together and made up with a view to repeated use; some have been used more than 25 times. Panels for the base slab are made up of three 2x6's bolted to transverse members in such a way that shrinkage will not warp the metal facing; all panels are cleaned and oiled before each reassembly.

Ready-mixed concrete, delivered to the job in trucks, contains a finely ground cement and a well-graded gravel-and-sand aggregate with 1.73 bbl. of cement per cu.yd. Water-cement ratio is varied somewhat for different parts of the work, the range being from a 3½- to a 5-in. slump. In the B and C type slabs the large amount of steel calls for the wet mix.

A major feature of the casting operation is the method of compacting the concrete. This is done by using vibrators progressively across the horizontal slabs; that is, concrete is dumped first at one end of the form, and the vibrator is started there. As more concrete is dumped in, the vibrator moves lengthwise across the form, thus tending to keep air bubbles ahead of finished work and to secure a dense placement. With a highly effective vibrating program and the gravity pull, it is found that rich

CASTING YARD (left), showing form set-up for slabs of L-shape type and storage yard in background. Finished slabs (right) are lying on face in storage. Note notches in recesses for timbers.





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mortar and the heavier rock move down toward the bottom face, giving a surface which, in the finished slab, has an almost glassy smoothness. Vibrators are used in both the upright and the horizontal forms.

The slabs are poured in forms placed in alternate locations along the casting bed. After the forms have been removed from the first four slabs, the alternate slabs are cast in place between and against those first cast. The surface of the concrete against which fresh concrete is to be placed is thoroughly coated with a film of tallow. This reduces formwork and insures a perfect fit because each slab is numbered and eventually is placed in the seawall in the same relation to other slabs that it occupied on the casting bed.

Slabs are left on the forms until compression cylinders show a strength of 3,000 lb. per sq.in. They are then moved by an A-frame derrick to storage space near by. To date this has required an interval of about seven days. Storage is provided for about twenty slabs. The casting program is governed by estimated progress on the job, which calls for the construction of 32 ft. of seawall per day. Casting beds are provided for 21 slabs.

Specifications required that the concrete show a 3,000-lb. per sq.in. strength after 28 days, and with the care taken to secure effective compacting, this requirement always has been exceeded. In a recent 28-day test of nine samples in compression, the lowest showed 5,346 lb. and the highest 7,835 lb. per sq.in. The average was 6,600 lb. per sq.in..

Contract for casting the slabs is held by the General Construction Co., of Seattle. Thomas R. Beeman is city engineer. Clark Eldridge, as bridge engineer, is in charge of the seawall design and construction, and H. F. Faulkner is in charge of tests.

One of the retired inspectors who called the Alaskan Way Sea Wall job one of his most interesting experiences in the City, passed along a bit of amusing information incidental to the work done in the tidal area:

"One of the carpenters who was installing forms on the sea wall was also the wearer of false teeth. One day at lunch time a particularly difficult bite loosened the dentures, and before he could catch them, they fell into the water. It was high tide at noon. By quitting time the tide was out. As the inspector went by, he saw the carpenter in his "long johns" down to his neck in water, hanging on to the form work, searching diligently with his bare feet for the missing teeth. Before long he found them. He was one happy carpenter because, in those Depression Days, the price of dentures was almost impossible to come by.

"On another day two of the helpers found a partly full bottle of hard liquor just before quitting time, and temptation overcame them. By the time they'd emptied the bottle, they were filled with tenderness for each other, for the timbers they were placing, and even for the "sidewalk superintendents" as they coaxed and nudged the big beams with soft words and gentle pikes, and finally got them centered, oblivious of the audience listening to their conversation. Many a good chuckle was had over that picture."

Advanced technologies and experience have taught that what was considered to be permanent is only temporary, and that untreated timbers between high and low tides require replacing from time to time. The sea wall is surveyed every year and in 1958 and 1959, plans were made to protect the steel sheet piling from further electrolytic corrosion. A cathodic system was installed which appears to have an arresting effect on one of the destructive factors plaguing the installation. Yearly inspections and continual vigilance, advancing knowledge of ways and means to preserve structural materials under and near sea water, as well as regular preventive maintenance, contribute to the life of the sea wall.

Seawalls at Alki Avenue and Seaview Avenue are also on Engineering's list of responsibilities and from time to time require attention. They are inspected periodically through the year. The following excerpt from the 1921 Annual Report of the Streets and Sewers Department indicates the frequency of repairs:

"The sheet piling bulkhead along Alki Avenue, built in 1914, was attacked by teredos and sand fleas despite its creosoted facing. These destroyers, together with the action of the undertow which was gradually lowering the beach in front of it, have so weakened the bulkhead that extensive repairs were necessary. After a thorough study of the best methods of construction, we concluded that a rock riprap laid on a slope of 1½ to 1 outside of the bulkhead was the cheapest permanent repair. Our plans were approved by the Board of Public Works and the Street Committee of the City Council; $33,623.49 was expended in 1920 in reinforcing the weaker section. The balance of the work, approximately $60,000.00 will be done in 1921."

Five thousand, four hundred feet of sea wall extended from the old Luna Park Pool Site to the bathing beach at Alki. In 1929 this sea wall was rebuilt with 18-foot lengths of interlocking German steel shipped from Hamburg, Germany. It cost fifteen dollars a foot and took three months to build the wall, but it lasted for 30 years before it required further attention. In 1961, the sheet piling in the section between Southwest Rhode Island Street and 53rd Avenue Southwest was beginning to give way where it was corroding from action of salt water and the battering of waves and floating logs. The fill was washing out through the holes and undermining back into the lawns, creating voids. It was considered dangerous for people to walk or stand along the bulkhead. A gunite face approximately three inches thick was applied to the steel piling which served as a support for the wall. A layer of riprap was later placed against the concrete surface.

This was the first job to be done with funds from the newly established Arterial City Street Fund. It was approved by the State Department of Highways and 75% of its cost came from this fund which had been set up with the one-half cent gas tax allowed to the cities for construction on arterial streets. The required matching 25% came from the City Street Fund.

Repair and reconstruction of sea walls is required at regular intervals, as some sea creatures make continuous inroads on any pervious material.

CHAPTER 5

Capital Improvement Financing and Local Improvement Districts

SEATTLE'S capital improvements are financed by the general funds of the City (tax derived), revenues of the utilities, State fund allocations and local improvement districts.

Engineering Department activities are closely associated with these funds as Engineering, unlike some of the Utility Departments, is not self-supporting.

GENERAL FUNDING

Seattle's second Charter of Incorporation, approved December 2, 1869, gave the Council the authority within the City to assess, levy and collect taxes for general municipal purposes, not to exceed one-quarter per centum per annum upon all real and personal property which was taxable by law for Territorial or County purposes. It could levy and collect each year a special tax of not more than one-quarter of one per centum for any specific object within the authority of the corporation; the ordinance providing therefor was required to specify the object and the estimated amount.

Interpreting the instructions of the Territorial laws and the Charter, and writing ordinances for the direction of the little City's operations, left many legal loopholes and opportunities for misunderstanding and many of the early assessments were permitted to become delinquent.

The 1869 Charter levied a road tax of not less than three nor more than nine dollars on every person liable to perform labor on the public roads within the City's boundaries, and all property was assessed not less than two nor more than six mills per dollar of valuation, as shown on the returns and assessment rolls of the assessor; this was for the improving of streets and roads in the City under the direction of the proper City authorities.

The Freeholder's charter of 1890 established the Street Fund,[1] from which was to be paid all expenses for street repairs, sprinkling and cleaning, highway and bridge repairs, and all other street improvements not otherwise provided for in the Charter. It also established a Harbor and Wharf Fund; a Sewer and Drainage Fund, from which all expenses for sewers and drainage construction and repairs must be paid; a Street Light Fund to pay for lighting the City by electric light or gas; a City Park Fund; a Public Building Fund; and a General Fund. The City Council could establish such other funds as were necessary, and was required to establish and continue in force all funds for payment of interest on all bonded indebtedness of the City. The annual tax percentage for each fund was established and appropriated accordingly; it was not transferrable from one fund to another except as provided in the Charter or by majority vote of the Council. Additional funds for State improvements have been derived from the various gas and motor vehicle taxes.

Local improvement districts are based on property valuations as set by the County Assessor for tax purposes, but the law has been liberalized to the extent that a low value area may occasionally be included in a project of high valuations, thus raising the limit for the total project against which the assessments may be levied. Such comprehensive improvements tend to increase all property values and this is of benefit in many areas.

A local improvement is usually initiated by petition of the interested property owners, but when health, sanitary, or other considerations of importance to the development of an area are involved, a Council resolution may initiate it.

In 1913, the City had set up a Local Improvement Revolving Fund to aid in paying local improvement district bonds at maturity. This was done because many times the assessments levied to pay the bonds were not all collected by the date of their maturity. A loan from the General Fund was used as a beginning and income for the Fund was derived from delinquent assessment payments, interest on bank deposits of local improvement funds, and in later years from the sale of tax acquired property. During the depression of the 1930s these funds were cut off and the General Fund loan was called in. Much property was sold by the County for taxes, and the tax title deed wiped out existing City assessments. The City lost a great deal of income during this period.

Since the cities' activities and income are controlled by State law, one of the problems has been that of getting necessary changes in the laws so that municipalities may have their proper share of the State's income to carry out their obligations.

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[1] This fund should not be confused with the City Street Fund established by statute in 1937 and financed by motor vehicle fuel taxes.

Without the aid of the local improvement district assessment system, it would have been impossible for the development of the City to have kept pace with its rapid expansion in territory and population.

In 1909 the State Legislature required all cities of the first, second and third class to include in their annual tax levies an amount sufficient to pay all unpaid local improvement assessments with all interest, penalties and charges thereon levied against all lands of such city, in accordance with a detailed statement showing the proceedings authorizing and confirming such assessments. This was known as the "City Property Assessment Redemption Fund," and from it was paid the oldest outstanding liens, or as much as the funds would cover. It also provided for loans from the General Fund when authorized by the Council, such loans to be repaid as money became available in the Assessment Redemption Fund.

During the period from 1890 to 1911 the cost of improvements amounted to over $40 million. Some $31 million was assessed against the benefitted property, and the other funds contributed the balance.

In 1911, the Legislature accumulated all the local improvement acts of the State into one Local Improvement Code, and added the provision for creating the enlarged district and the authority to assess cost of water-main trunks as well as trunk sewers over all the area to be served by such trunk mains.

The General Road and Bridge Fund was established by Legislative action in 1915. It provided for a tax of not more than four mills on the dollar on all taxable property in the county, for the purpose of constructing, maintaining and repairing county roads, bridges and wharves which were part of the county road system. Gravel pits and quarries and their operating machinery were included as legitimate expenses to be covered by this fund. Fifteen per cent of all such money collected by the County was required to be returned to the City for use on all City roads that led into County roads.

In 1900, there were 130 automobiles in Washington; there were no buses or trucks. There were no garages, service stations or accessory shops. Registered vehicles in 1906 amounted to 6,763. In 1975, within the City limits of Seattle alone, 433,075 motor vehicles were registered. This was a 90,000 gain over those registered in 1965. The incerase of motor vehicles has influenced our tax status, road and street construction and other improvements.

The State Department of Highways was created in 1905. Counties had opened extensive roads but they had not been unified into a State Highway System. The Good Roads Movement which had been stirring for several years was stimulated by the increased use of automobiles, the switch in population from rural to urban areas, demand for access between timber, farm and mining sections and railroads, and the industrial surge in the Puget Sound industrial area resulting from the Klondike gold rush.

The State Aid Law of 1907 reversed the policy of local responsibility which had prevailed for more than half a century and which had left road building to any area that wanted a road. After 1915, highway use taxes began to be available for highway maintenance purposes. In 1917 the Motor Vehicle Fund was created. This Fund included motor vehicle license fees. In 1921 a one-cent per gallon gas tax was imposed and the importance of property taxes as a source of highway revenue has gradually declined since that year. Gas taxes increased to two cents per gallon in 1924, to three cents per gallon in 1929, and five cents in 1931.

State highways increased from 169 miles in 1910 to 2,967 miles in 1920. The Federal Aid Highway Act, passed in 1916, opened the way for Federal aid to state road construction, now very much in evidence in the nationwide system of interconnecting, standard highways.

The highway code was revised by the Legislature in 1937, and over 2,000 miles were added to the State Secondary System. Surface conditions have improved from a largely graveled system to an almost entirely paved or oil treated system.

The Federal aid formula required that states match Federal apportionments. As national forest and public domain increased, the Federal contribution to the matched dollar was also increased over 50% to compensate for the State's land loss.

Chapter 187 of the Session Laws of 1937 (Senate Bill 146, Section 62) provided for the administration of county roads by counties and city streets by incorporated cities and towns, with state supervision thereof; prescribed the powers and duties of certain officers and all the various procedures pertaining to road building and financing, and provided for Federal aid funds in many instances. Money from the Motor Vehicle Fund was paid to incorporated cities and towns on vouchers for reimbursement for expenditures which were properly supported and approved by the Director of Highways. It was used for construction, alteration, repair, improvement and maintenance of City streets or for any other proper street purpose. Seattle Ordinance No. 67365 established the City Street Fund in May 1937, to accumulate these and other moneys to be used for State primary highways within the City, as required by the new law.

Before 1935, the cities and towns of the State were allowed a relatively small sum from State gas tax money, and this could be used only on projects approved by the State; this was greatly irritating, especially to cities such as Seattle with long distances inside the City Limits. The Association of Washington Cities approved a measure that would provide the cities with a certain percentage of all the money received by the Motor Vehicle Fund, and with no control imposed by the State. Most of the electors in the State lived in cities and at the general election preceding the 1939 session, a carefully worked out campaign was executed. Petitions were placed at every precinct in cities of the first class, and every other voter, as he left the polling booth, was told of the financial benefit that a greater share of the gas tax money would mean to the cities. He was then asked to sign the petition exactly as he had signed the voting register. This netted a heavy petition with practically every signature correct.

The AWC representatives approached the Legislature and threatened to file the petition for a popular vote on the distribution of the gas tax revenues. As a result the cities were given, in 1939, a 15% share of the net gas tax rate. Several other provisions are made from the gas tax moneys and when the final remaining balance is determined, it is credited to the incorporated cities and towns on a population basis.

Since the only census figures were the Federal records of every ten years, it was apparent that a more recent count should be used for a proper and fair apportionment; but the State Census Board was not created until 1951.[2] One member was from the University of Washington, one from the State College faculty and one was appointed by the Governor, until 1967. This Board made the population report on April 1 from information available on the first of January of each year.

In 1949, the gas tax legislation prescribed the streets, bridges and wharves which formed part of the State primary and secondary highway systems, through all incorporated cities and towns and detailed the precise duties and obligations for all recipients of the gas tax moneys.

In 1953 the General Road and Bridge Fund was abolished by the Legislature and a portion of the Motor Vehicle Fund was apportioned to create the Secondary Highway Fund, classifying the public roads in the State as primary and secondary, and providing how and by whom they are administered. To the cities of the first and second class having streets which are a part of the route of any primary State highway or extension of such, the State remitted a sum of $500 per mile annually, less any amount vouchered for maintenance or repairs. This sum must be accounted for and spent only on the streets which are portions of the State Highway System.

The 1961 one-and-one-half cent increase in the gas taxes gave the cities of the State a total of approximately one-and-one-quarter cents and the State one-quarter cent for every gallon of gas pumped in the State. Seattle's share of the one-half cent special allocation to the cities goes into the Arterial City Street Fund which was created by Ordinance 90497, August 21, in accordance with the Session Laws of 1961. In it are deposited the City's contribution from other sources which must amount to not less than one-quarter the amount from the State. A complete record of this fund and its use is kept by the City and regularly reported to the State Department of Highways. This record was a key element in preparing Seattle's Capital Improvement Program which complies with the requirements of the State and also furnishes a ready reference to all City and State officials of proposed and desired improvements, indicates the order in which they may be carried through to completion, and the method of paying for them. This program is regularly reviewed by the Capital Improvements Committee and the Planning Commission. Thus the best use can be made of funds as they become available and a continuous growth pattern can be maintained.

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[2] This was abolished in 1967, its functions being taken over by the Planning and Community Affairs Agency (Laws of Washington, 1967, Vol. II, Chapter 42, Sections 3 and 4).

Local improvement district bonds issued for improvements initiated before 1927 were backed only by the property assessed in the district on which the bond was issued. In 1927 legislation was passed to guarantee the payment of such outstanding local improvement bonds and warrants by establishing the Local Improvement Guaranty Fund.[3] All taxable property contributed to the fund but never to exceed 5% annually of the outstanding local improvement bonds and warrants. Other local improvement funds or income accruing to the City, or surpluses in local improvement district funds, go into this Guaranty Fund.

Before establishment of the Local Improvement Guaranty Fund, contractors on a local improvement job were required to sell their own bonds when the contract was awarded; they had to guarantee payment of all charges against the district, including the City's inspection and clerical charges, thus making it necessary to add a sizable percentage to the original bid to cover such charges. The City delivered the bonds to the contractor at par, but brokers usually discounted them from 10% to 15%. The banks bid low on unpopular bonds, while bonds from a popular district brought a higher return and sold quickly. The Retirement System began buying all the local improvement bonds and warrants at par in 1956; this was a progressive step for both the City and the Retirement System, and the property owners in the improvement district also were helped substantially.

The Tax Property Sales Fund was established by Ordinance No. 46473, approved February 14, 1924, and by a $50,000 loan from the General Fund, at a time when much property was being foreclosed for various local improvement assessments. Delinquent assessment property is appraised and sold for enough to pay all taxes and assessments, and the property is returned to the tax rolls. This procedure may take many years, but, gradually, all foreclosed properties find their way back to the tax rolls and the City recovers the money it had advanced to protect the improvement district.

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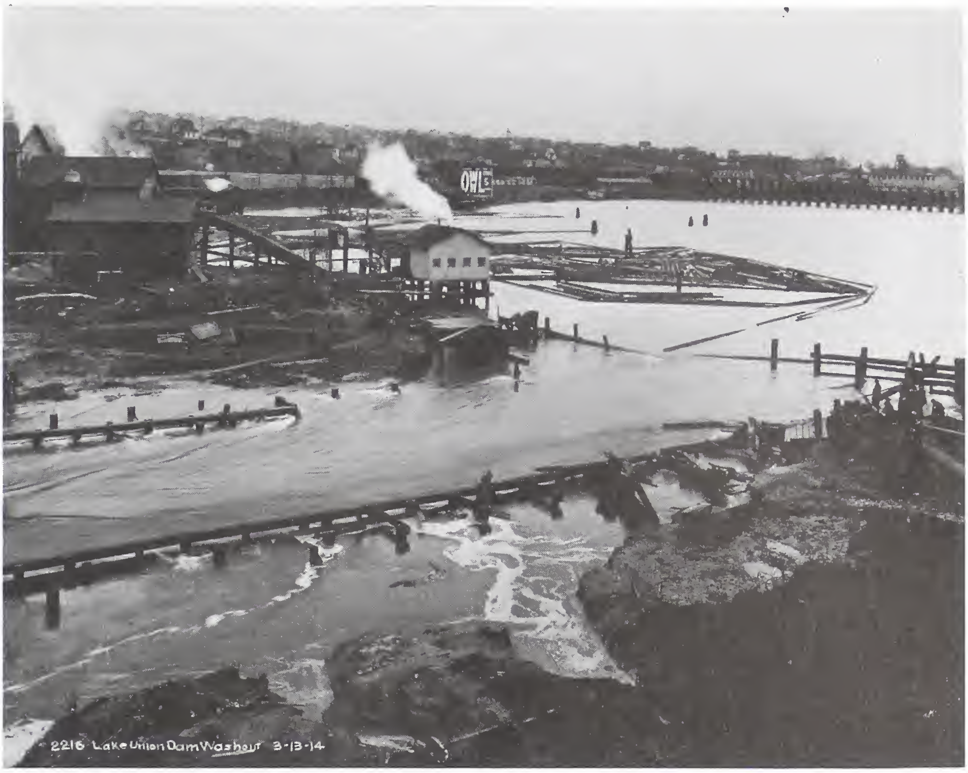
[3] (Chapter 309, Laws of 1927.)

In 1943 a Special Revolving Fund Series "A" was established, the income of which was to purchase certain bonds and warrants that had not been protected by the Local Improvement Guaranty Fund law. The City's ordinance under this law was passed in 1944 and permits the City to purchase at not more than ten cents on the dollar of the principal face value any unguaranteed bonds that have not been delinquent for more than fifteen years, and to the extent that cash is available in the Fund for such purchase, all within the provisions of the statute and ordinance.

Several worthwhile changes sponsored by the City Council, the Engineering Department, and the Association of Washington Cities have been made in the local improvement laws. One of these was the consolidation of separate units in the same vicinity into one local improvement district; a number of scattered alleys all requiring paving may now be combined into one paving job; or a series of street improvements including sewers, grading, paving and sidewalks may become one contract job. These produce better bids by increasing the scope of the job, as well as reducing the fixed costs, and thus may save from 10% to 25% of both City and property funds.

The 1945 legislation provided that the limit of assessment could be exceeded if the improvement was considered necessary to preserve the public health, or if 60% of the property owners petitioned favorably for the improvement. In a highly desired improvement with a unanimous district, the process follows a well-developed procedure, but protests by the property owners amounting to 60% of the estimated cost of the improvement deprives the City Council of jurisdiction to order the work, except in the case of a sanitary sewer or watermain project where the public health and safety would be jeopardized. In such a case the project may be ordered over the 60% protest. A project which has separate schedules may have one or more schedules eliminated if the protest on each reaches the said 60%, allowing the remainder of the project to be ordered. The deleted schedules are sometimes incorporated in later projects.

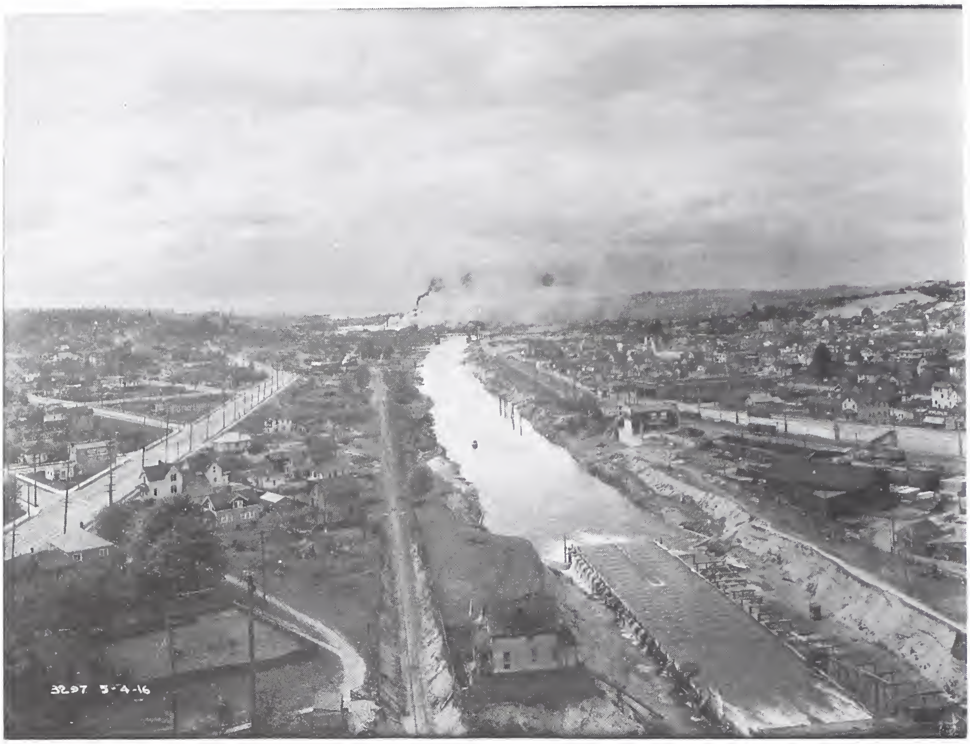
The improvement of Shilshole Avenue, the contract for which was awarded to the firm of Holt and Jeffery on May 26, 1913, is an example of what could happen in the days before funds were available to guarantee local improvement assessments. This was known as Local Improvement District No. 2601 and provided for grading, regrading, curbing, planking and replanking, paving and repaving, sewers, watermains and water services, fire protection, concrete and wooden walks and drainage on Shilshole Avenue and Ninth Avenue Northwest from 14th Avenue Northwest to a point several hundred feet northwesterly at about Market Street. Government work on the ship canal excavation was to begin on January 1, 1913, and some of the excavated material from the waterway was to be used in the fill. Street grades along Shilshole Avenue had to be raised seven to nine feet to be even with the new water level of Salmon Bay; a 16-foot elevation was finally accepted to provide for proper drainage and sewer



During the 1850s a dam had been constructed across the westerly outlet of Lake Union, raising the lake level some eleven feet. As the years passed, it more or less faded away, along with any recollection of the purpose for which it had been built; in 1914 what was left of it disintegrated lowering the lake back to the level it had been before. This somewhat simplified the problem of dredging the channel for the Ship Canal two years later. The north end of the Stoneway Bridge is visible in the background.

grade, though some of the engineers tried to hold out for an additional two or three feet. 7,145 feet of dike substantial enough to hold fill along the dredged waterway, and the weight of the fill behind it—much of it taken from the bottom of the new channel—was required along the water side of Shilshole and Ninth Avenues. Four hundred thirty thousand cubic yards of fill were indicated on the plan of the job, but this fill could not be completed until the level of the water was raised to serve as a counterweight for the fill behind the dike. High assessments were protested by the property owners. Many of those who did not protect their premises from the filling operation suffered flood damage from the sluicing of the fill in the street area. The grade of the streets was left so near to the new water level that street drainage was poor and there was insufficient grade for many of the sewer lines which had to be installed or repaired when the fill was completed.

In June 1914, the contractor was forced to close down dredging operations because he was unable to sell the warrants issued to pay him for his



Ship canal between Salmon Bay and Lake Union under construction May 1916. The temporary cofferdam structure near Fremont Avenue compensated for the tidal effect on the Salmon Bay side of the canal until the Chittenden Locks were completed during July and August of that year. The lining of the banks with concrete was begun shortly after this picture was taken.

work. He finally suggested that some provision be made by the City to insure final payment.

The Shilshole Avenue job was completed and accepted on June 18, 1915, with a deficit of over a hundred thousand dollars in the local improvement district fund. This deficit was created by the extra fill, grading and surfacing that had not been anticipated by the contract. An agreement was made between the City and the bond holders to pay $125.90 on each $200 bond; interest ceased when the partial payment was made. The time for making a reassessment ran out and the bonds which cover this part of the Shilshole Avenue assessment have never been redeemed.

ENLARGED LOCAL IMPROVEMENT DISTRICTS

Before 1927, the City had no means of financing large thoroughfares except by the enlarged district, a method of increasing the extent of the property benefited by the improvement. The type of thoroughfare constructed was limited by the amount of money available from assessments. The improvement was initiated by a petition which created the enlarged

Photo by Charlie Heib

SEATTLE CITY COUNCIL from left to right: Tim Hill; Randy Revelle; Phyllis Lamphere; John Miller; Sam Smith; George Benson; Jeanette Williams; Paul Kraabel; Wayne Larkin. 1975

district and described its boundaries; it specified the costs to be assessed which were determined in accordance with the individual and peculiar requirements of the district. The boundaries were established at the limits of the benefited property.

Enlarged district financing was first employed in the years before the various state funds were established for street improvement. Before 1927 there was a General Road and Bridge Fund which, with the addition of a percentage of the property tax, was the only available fund for street improvements. At that time it was usually necessary to condemn the right of way before the highway could be built, and the condemnation charges were also assessed against the property.

As a typical enlarged Local Improvement District, Avalon Way was a paving project including ten streets to be constructed under the enlarged district plan. In addition to paving, sewers, side sewers, watermains and hydrants with necessary appurtenances, concrete sidewalks, grading and regrading, and any required trestle roadways were to be included. The project joined the Spokane Street area to Fauntleroy Way and thence to Lincoln

Park. It was proposed to open the territory from West Alaska Street to the City Limits on the south and provide access to California Avenue. Eventually the project involved a great deal of grading and some sidewalk work, in addition to the paving. Watermains were desirable but they would have added too much to the cost; there was a preponderance of undeveloped property in the entire district so curbs were eliminated; they were to be constructed only when the watermains were added. Street rights of way were graded 100 feet wide and fills up to 54 feet wide were added in the ravines; the basic improvements were done so that the property could be developed. Some of the cross streets were graded and filled. Sidewalks were laid where traffic warranted and some stretches of the improvement over unsettled fill were either temporarily planked or the construction was left entirely to later improvement. Property owners petitioned for additions and eliminations as the work progressed. By constructing the improvement to the City Limits, some aid was available from the County, as these streets also served County residents. $50,000 was appropriated from the General Road and Bridge Fund to aid the improvement. Local improvement assessments made up the balance. The street to Lincoln Park Beach was one small part of the project and the Park Board was urged to have it included in the improvement and to assume its cost and provide for its maintenance.

For economy's sake, paving usually followed a plan of finishing only part of a street's width; 18 feet of concrete was laid along one side of the street and the car tracks were placed in the graded strip adjoining. In many cases the remaining 18-foot strip was surfaced later when needed. The abutting property paid $3.60 per front foot and the property on the opposite side paid $2.40.

The entire Fauntleroy area benefited from the improvement and the enlarged district included some 4,000 pieces of property. The contract was dated November 9, 1923, for $170,000 and 480 days were allowed for construction. One of the special directives notified the contractor that city wages for common labor were $4.50 per day. The standard plans and specifications covered all the construction details. Some items from the proposal are of interest as a matter of comparison:

		1923	*1967*	*1975*
Wood Curb and Gutter	—	$ 50.00 per MBM	—	
Asphalt Paving, 5″ Base	—	3.50 per sq. yd.	—	
Concrete Paving, 7″ Thick	—	2.00 per sq. yd.	5.50	10.00
Concrete Paving, 6″ Thick	—	1.80 per sq. yd.	4.80	9.50
Planking	—	38.50 per MBM	—	
Catch Basins, 1 inlet	—	110.00 each	610.00	900.00
Catch Basins, Special Inlet Top	—	100.00 each	450.00	600.00
Catch Basins, 3 Inlets	—	150.00 each	990.00	
Curb Inlets	—	9.00 each	75.00	
3″ Sewer Pipe	—	0.20 per lin. ft.	5.00	

Changes in specifications have eliminated some items, added some and made changes in others.

The Avalon Way project had been first petitioned for in 1914 and was accepted for maintenance in February 1925, eleven years thus elapsing from inception to completion. Assessments were paid either in cash within the thirty-day period following approval of the assessment roll, or in the regular ten equal annual installments plan. Available correspondence indicates that one owner protested an estimated assessment of $551.14 for grading, paving and watermains for three local improvement districts in one year, and as this sum seemed large, the following figures from the U.S. Government have been secured for purposes of comparison to show the percentage of the population in the various income groups for two years.

Earnings/Wages	*1923*	*1960*
	%	%
Under $1,000	25.0	1.2
$1,000–$3,000	37.9	48.5
$3,000–$10,000	32.2	37.2
Over $10,000	4.3	9.2

The paving of Aurora Avenue (opened to traffic in mid 1933) was an enlarged district project, it being obvious that abutting property alone could not carry the burden of the cost for such a thoroughfare. Traffic from a much greater area and distance would be channeled to this artery. The route for the new highway created a subject over which the newspapers and the populace developed many a hot discussion, and a good deal of bitterness and misunderstanding was generated before the plans finally crystalized. Throughout the entire area there were many local improvements where sewers, watermains and/or sidewalks had been provided which still had many years of service remaining in them, though the standards to which they had been originally built had changed. Disturbed wooden water mains were replaced with cast iron pipe. Where sewer pipe was replaced, concrete pipe was used.

After securing the right of way came the problem of adjusting costs to property. There were 30,000 pieces of property in the roll, some of which had paid recently for one or another of the improvements; and these had to be reimbursed pro rata for the amount of life remaining therein. Figuring these rebates was a tremendous job and took weeks of time and several thousand dollars' worth of clerical work in the department. All the amounts had been carefully shown on a special map of the area for quick reference. The job was done, and the clerk who had performed the task, Margaret Kumblad, laid the roll across an empty waste basket while she cleaned her desk—and forgot it. In the morning there was no map anywhere around the desk where it should have been, or at any other desk in the section. So she and her supervisor made a trip to the waste paper packaging plant on First Avenue South, hoping that their expensive map hadn't been through the shredding machine or bundled for waste paper yet. The foreman of the plant permitted them to watch the carrier belts but assured them that the City paper had long since gone by. They stood for a while and were about to give up when along came the roll of blue print paper, just as it had been left the night before, neatly rolled and unharmed. With sighs of relief they snatched it out and got back to the office and the next assignment.

The rebates were figured only for the remaining life of the improvement; it was considered that paving would last 30 years; concrete sidewalks, 40 years; wood watermain, 16 years. The rebates were subtracted from the current assessments, which amounted to about $40 for the average lot. There were, nevertheless, many legal problems to be settled.

Aurora Avenue, being a primary State highway, required the combined efforts of County, State and City in planning, construction and financing. George Washington Memorial Bridge, commonly called Aurora Bridge, was built by the State, and State funds paid for a large share of the paving. The City was responsible for its own utilities: sewers, watermains—and a portion which would equal the cost of residential paving. The area from north of Pike Street to Denny Hill and eastward to Westlake Avenue was included in the district as highly benefited property, and the northerly boundary was along North 40th Street. Buildings which had to be moved or removed created problems; so did utilities such as light poles and watermains. Much grading was required along the steep southeasterly slopes adjacent to Westlake. Many of the business property assessments were reduced by Court order and there were numerous protests. Had protests been permitted until the contract was to have been let, the Council might have lost jurisdiction over the improvement; the preparatory engineering would then have been wasted, and we might still be getting to and from downtown to George Washington Bridge by way of Dexter Avenue.

The Revised Code of Washington, [Ch. 35.43.040] provides that "Whenever the public interest or convenience may require, the Council or other legislative authority of such city or town is hereby authorized and empowered to order . . . the (construction of) field houses, gymnasiums, auditoriums, swimming pools or other recreational or playground facilities or structures. . . ." Senator Lady Willie Forbus, who was a resident of the Magnolia District, sponsored this provision as an amendment of the local improvement statutes, to make it possible to finance by enlarged district the facilities mentioned therein. It was duly passed by the 1945 Legislature. The first attempt to use this amendment was made late in 1953 when the Magnolia Community Club became interested in building a swimming pool as an adjunct to the Junior High School. This project well exemplified the need for enlarged districts where the benefits derived go beyond the limits of assessment possible in the Zone and Termini method, under which the cost to the individual abutting property would be prohibitive.

What amounted to an Origin and Destination study, the results of which were tabulated and projected on a map, was made in connection with the existing Evans Pool at Green Lake. This pool was used by people who came from as far away as Renton and Bellevue. Many came on foot for a mile or more; many came by bus or car; the benefits appeared to be general. A University student had made a thesis study, determining that seven pools should be developed for the Seattle area. This was considered to be preventive safety, as it was also discovered that many people who didn't know how to swim were boating on both the Sound and lakes. The results of this study were used in planning the Magnolia pool.

The Magnolia area was divided into three separate districts for assessment purposes, using a 60-foot by 100-foot lot as the average. Assessments per lot were to be approximately $41 in zone 1, $28 in zone 2, and $15 in zone 3. The business property in the Village area and the multiple residence property was to be assessed twice the residential rate, and a contribution from City funds approximating 10% of the cost of the improvement was to be allowed. Preliminary plans and a roll involving approximately 7800 property descriptions were prepared; a hearing was held and the work ordered. However, at this time protests to remove jurisdiction were legal until the time the contract was awarded. Strong opposition to the improvement developed and a majority protest appeared to be certain. The City Council decided against continuing with the project.

The Magnolia Playfield experience had one significant result: The Local improvement district statute has been changed and presently provides that protests, to be valid, must be filed within 30 days after the Mayor signs the ordinance creating the Local Improvement District.

Another venture under the enlarged district plan was the Soundview Playfield,[4] which was actually built. It was the first successful use made of the 1945 Amendment to the Local Improvement District Law.

When the old Olympic Gold Course was platted and sold for residential property, one of the television commentators stirred up some interest in developing a playfield in that area. Ordinarily the City is petitioned, and institutes Eminent Domain proceedings to acquire any property that it may require by condemnation. This time, however, it was able to buy about 15 acres for $35,000 with the understanding that the property owners would finance the improvement of the playfield. One of the radio commentators circulated petitions for the playfield improvement to be paid for by direct assessment, and a committee of property owners worked with the Park Board on the design. At about the same time, the School District acquired adjoining property for a school. There are two separate playfields, four baseball lots, two tennis courts, many facilities for small children, and parking spaces for cars. As much advantage was taken of natural growth and contour as was practicable. Use was also made of some of the Government buildings left on the site.

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[4] Strictly speaking, Soundview Playfield was not a true enlarged district, because it had no direct lateral assessment on property abutting the playfield. This form of assessment is a statutory requirement for an enlarged district. Although really a benefit district, the Soundview Playfield is a good example of a successful district established over a large area. (Ordinance 89726)

The boundaries of the enlarged district were placed at West 85th Street on the south, Carkeek Park on the north, 8th Avenue Northwest on the east and the bluff line above the Great Northern Railway on the west. An assessment roll was prepared and the area divided into two zones. The first zone lay generally within a half-mile, considered normal walking distance, of the school and playground center. The assessment in this zone was $0.00374 per square foot or about $30 for the average lot of 60 feet x 120 feet. The second zone consisted of the remaining area outside the half-mile zone and its assessment rate was two-thirds that of the first zone, or $0.0025 per square foot—about $23 for the average lot. To further reduce the cost, it was made an immediate payment assessment roll, which allowed about two months after completion of the project before the late payment penalty was charged; this saved interest and clerical charges. The City's contribution to the engineering costs, and the Park Department's share amounted to about 20% of the $135,000 job, and the balance was considered as benefit to the general public.

The work was done under contract, through the Board of Public Works. Without the enlarged Local Improvement District method of financing, this project would not have been economically possible.

The Enlarged District law is still "on the books" but it is used infrequently. The fact that the City contributes to the expense of the improvement and at the same time levies assessments against the property, causes legal questions to arise and has created problems.

CHAPTER 6

Streets, Arterials, Freeways and Parking

THE first road in King County as used by Thomas Mercer, Henry Van Asselt and H. H. Tobin, extended from Seattle to intersect the Fort Steilacoom-to-Walla Walla Road. It was called Road No. 1 of King County but was in reality a territorial road. Two others were established in 1854 by the Legislature and became known as "The Military Road." One portion was the road from Fort Steilacoom to Seattle and the other was from Seattle to Bellingham Bay, completed about 1863. These roads were originally intended for the movement of militia to protect the settlements from possible emergencies, but they became essential in enabling the newcomers to get into the Puget Sound Country. They were cut out of the wilderness and were rough and full of stumps. Only the sturdiest wagons could be driven over them. In the low or swampy places, puncheons or small logs, were laid to support the weight of the wagons and they were rough riding. Sophie Frye Bass, recollecting her pioneer childhood days, recalled how the wagons creaked and lurched as the horses struggled over the rough surface.*

Part of Road No. 1 followed the line of Beacon Avenue from Chicago to Willow Streets, to about Hanford Street on Beacon Avenue and along Cheasty Boulevard to Rainier Avenue and thence around and between the hills until it reached Yesler Way and the waterfront. It touched the claims of Horton, Van Asselt, Hanford and other of the valley dwellers on its route. Portions of this old road show on maps for Townships 22 and 23 North in the City Engineering Department and are indicated on a current Kroll Map. A short section of the Military Road is shown on "Roads on the Ground" in the King County Engineer's Office.

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* "Pigtail Days in Old Seattle"

The road which extended northerly from Fort Vancouver, and which connected Fort Puyallup, Fort Nisqually, Steilacoom and Olympia, was built under the supervision of Captain George B. McClellan (later General McClellan of Army of the Potomac fame), pursuant to an 1853 Act of Congress which appropriated $20,000 for the purpose. An all-year road, it followed the crest of the ridge that forms the western rim of the White River Valley not far from the Duwamish to where the road slipped over the cliff that bordered the Puyallup. It followed near the crest of the hill as it approached Angle Lake and then along the Highline Road to Star Lake. Portions of this route were later incorporated into later highway systems between Seattle and Olympia.* Early County roads followed the same routes, and the name "Military Road" is still seen on road signs along portions of the old highway.

The Reverend Daniel Bagley was the first to enter Seattle over the Military Road from the south when he came by horse and buggy in 1960; he later recorded that he had to wait several hours while fallen logs were cut and removed from the roadway. The northern portion of the Old Military Road followed First Avenue to Virginia Street, then out Dexter Avenue and through Woodland Park, past Oak Lake, and through Washelli Cemetery to Snohomish. A second northward route was provided in the event of a need for a secret move by the military. From Snohomish, the road had been slashed out in 1855, but was almost impassable in many places, having become a mere pack trail. The northern portion was known as "Whatcom Military Trail," the "Territorial Road" and sometimes as the "Telegraph Road." In 1855, it became established as a County Road.

In 1862 a road was surveyed from Main Street along the edge of the beach where it met the bluff of Beacon Hill. It was known as the "Beach Road" and served as the main route for travelers south and east for about twenty years. It has evolved through several name changes; Grant Street followed the same general route when it was established on a trestle; later it became Seattle Boulevard, and then Airport Way.

The Beach Road passed the J. J. Moss place to meet the country road from Alki Point and then turned southerly to the Military Road, which was the route from Fort Steilacoom to Fort Walla Walla. For some reason Dr. Maynard was not in favor of this road and did what he could to delay it; but it was, nevertheless, finally approved. A certain George Holt was paid $100 for damages to his place when the road was opened across his property; this is the first recorded case of damages in consequence of road making in King County.

With constant attention the Beach Road was kept passable during most of the summer; winter travel was on top of Beacon Hill on the road which became part of the Military Road between Fort Steilacoom and Bellingham Bay. Years later the railroads were built on raised ground just a little west of the old "Beach Road."

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* The route has been traced from memory of the early settlers and from records that were incomplete and its extent has been somewhat beclouded in the City's immediate area.

County roads began in Seattle. The great distances between places were a disadvantage for both City and County; road building in the natural terrain was too costly for the resources of either unit to bear alone. Many roads were privately built by groups of people who wanted to get from where they were to a town or to some other common destination.

No reference is made in the records of any roadway surfacing until 1879 when Yesler Way was planked. In 1865 the trail from Third Avenue and Union Street to the Pontius claim near Lake Union became so well defined that it was declared to be a County Road. Yesler's Road went to Leschi Park; McGilvra Road developed into Madison Street and went out to McGilvra's home near Madison Park. A road was cut through from it to the Portage at Montlake. In 1876 a road connected Salmon Bay with Green Lake. By 1882 the town was growing toward Lake Union and more or less permanent walkways were greatly desired. A subscription of $424 was raised and a three-foot wide, 4,531-foot plank walk was laid; it passed through the Pontius claim and on down Lake (Broad) Street. Altogether, seven and one-half miles of sidewalk had been laid by the end of 1882. For many years planks were used for both sidewalks and for streets, lumber being plentiful and dry and clean under foot—at least before wagon traffic increased: then it became less desirable and wore down rapidly.

During this period the streets, roads and alleys within the corporate limits of the City were under the exclusive control of the common council, except where they became portions of Territorial or County roads; in these cases they became the responsibility of the Territory or County.

In 1888 clay bricks were much in demand and the local clay companies couldn't keep up. Many bricks were brought from Port Townsend, Victoria and from Japan at $12 to $15 per thousand.[1] Vitrified clay bricks were considered to be the ultimate in street wearing surfaces, but they became slippery and afforded poor traction to horses and, in later years, to cars on inclined surfaces.

In 1891 the City's first engineer under the new Charter quoted an article in his annual report which severely criticized planking in streets as a harborer and spreader of disease and infections and urged that plans be made to replace all planking with permanent material as fast as the surfaces deteriorated and as soon as finances permitted. By 1893 gravel was being used on some streets but it was difficult and expensive to haul in the quantities required. A cubic yard of gravel, or of sand and gravel, weighed about one and one-half tons. Under favorable conditions a team could pull a load of about three cubic yards; sometimes when conditions were above average a team could haul a ten-ton load, but many times such a wagon load required two teams to move it. In 1893, to demonstrate the advantages of brick, the Denny Clay Co., at its own expense, laid an experimental block of brick on the west side of First Avenue between Washington Street and Yesler Way from the sidewalk to the right of way of the Front Street Cable Railway line, an area about 240 feet long and 20 feet wide. About 1905, it had a six-year contract at two and one-half cents per square yard per year (payable on the 20th day of the first month after the end of the first full year) to maintain Connecticut Street brick pavement from First Avenue South to Railroad Avenue.

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[1] The Diller Hotel on First Avenue dates back to that era and was built with bricks from Japan.

Union Street between First and Second Avenues was bricked in 1894 with four-inch bricks on a sand cushion over a lean concrete base. When the street was resurfaced in 1923, the bricks and sand were removed and five inches of concrete was laid directly over the old base. The contract to pave Yesler Way, Washington Street, Main Street, Jackson Street, Occidental Avenue, Second Avenue South and Third Avenue South with brick was let on March 9, 1901.

The Stetson and Post Co. which, in 1895, filled an order for five million cedar blocks for paving in Indianapolis, furnished wooden paving blocks for several of Seattle's streets, some of which were still in use in the 1920s. Late in 1894 Cherry Street between First Avenue and Second Avenue was paved with cedar blocks on one side and with fir blocks on the other, in order to learn the wearing qualities of each; a total of 1140 square yards of wooden blocks being laid. Wooden blocks were laid on Columbia Street between First Avenue and Western Avenue about 1905. The blocks rested on sand and lasted eight to ten years before they were removed; seeping water was suspected of having caused the rotting and softening at the corners. In 1909, creosoted wooden blocks were laid on Fourth Avenue in the vicinity of University and Union Streets. Second Avenue north of Madison St. was another section of wood block surface. Creosoted wooden blocks were also laid on Twelfth Avenue south of Madison Street where they remained up to the 1930–40 period. They afforded no footing on the grades, and several letters were addressed to the City Humane Society requesting that some consideration be given the horses that slipped and fell on these streets. Rain on the oil-treated blocks added to their slickness, and even though wood formed the quietest surface then known, the blocks were not extensively used. Even the stone and concrete had to be treated to furnish footing for the horses until after the First World War when, displaced by motor driven vehicles, the animals rapidly disappeared from the streets. The cost of wooden blocks and of vitrified clay bricks was about the same.

Where wooden blocks were used as paving on streets where the cable railway lines ran (as, for example, at the intersection of 12th Ave. and

Madison Street) they had the further disadvantage of swelling up in wet weather and closing the grip slots; whereupon no cars could pass until workers, armed with long bars, had pried them open again.

In 1900 there were 106 miles of streets. Forty-eight thousand square yards of streets and alleys were permanently surfaced, mostly with vitrified brick, which had been laid in 1895 and 1896. Convincing property owners that maintaining planked streets, which had a useful life of less than ten years, was unprofitable and was a continuous public relations project. A license fee of ten dollars per team was considered reasonable and was recommended as an aid in the maintenance program.

The tabulations in Tables I and II, Chapter 18, provide data for sidewalks and streets from the time consistent records began to be regularly kept, and the City's population at 10-year intervals. Street construction and maintenance programs sometimes overlapped, paving and planking records merged and separated during the years, but generally the figures show a trend toward elimination of wood-planked streets and sidewalks. By 1965, the wooden sidewalks had been almost entirely removed, less than a mile of them being indicated in the annual report.

Statistics compiled on December 23, 1904 showed that these vehicles crossed the intersection of Second Avenue and Pike Street:

1,375	1-horse express wagons
1,682	2-horse express wagons
571	2-horse lumber wagons
32	3-horse lumber wagons
72	4-horse lumber wagons
32	2-horse trucks
3	4-horse trucks
178	Buggies
14	Automobiles
Total 3,959	Vehicles

Express wagons included everything with springs, including furniture and butcher wagons. Lumber wagons hauled brick, gravel, sand, coal and garbage. Buggies were anything driven for pleasure, or as passenger conveyances.

The number of all kinds of teams that crossed the intersection of First Avenue and Cherry Street on January 7, 1904 was:

967	1-horse express wagons
1,108	2-horse express wagons
414	2-horse lumber wagons
2	3-horse lumber wagons
37	4-horse lumber wagons
49	2-horse trucks
3	4-horse trucks
165	buggies
Total 2,745	vehicles

In 1908, the City purchased a used asphalt plant and made asphalt road mixes available to small contractors who had no plants of their own; this enabled them to bid on small street paving jobs, and to purchase the asphalt from the City. The plant was to be operated by power from the garbage destructor and was expected to bring down the cost of street improvements for the City, but the plan for power did not work out. In 1912, the asphalt plant was transferred from the Engineering Department to the Streets and Sewers Department. This put street maintenance entirely in one department along with the means and material for making the repairs. The original plant was modified and a heating system installed to keep the asphalt in liquid form. The recommended site for the rebuilt asphalt plant adjoined the Fremont car barns of the Seattle Electric Company, where there would be access to deep water traffic as soon as the Lake Washington Ship Canal was completed. More storage capacity was added and other improvements were made which enabled the City to furnish asphalt for building and repair at much cheaper rates than could be had from the commercial plants. With the full use of its own plant and facilities, the City took over the maintenance of all the streets; and the street maintenance contracts were accordingly discontinued, the contractors no longer being required to include the cost of the 10-year maintenance program in their bids. City Engineer Thomson reported that actual construction work done in 1909 amounted to one-quarter of the entire quantity of work done in the previous nineteen years.

In 1913 street maintenance costs dropped, except for the cost of planked streets. As the result of the increased use of automobiles, the Department asked for authority to limit the size of the load that could be transported over these. The City Engineer informed a correspondent that up to December 1, 1913, the City's streets were hard surfaced as follows:

Asphaltic Concrete (¾″ minus)	5,736 square yards
Asphalt (sand only)	2,097,024 square yards
Asphalt Top on Bridges	46,835 square yards
Brick	876,369 square yards
Wood Block	5,838 square yards
Sandstone Block	228,357 square yards
Granite Block	65,642 square yards
Concrete	6,858 square yards

The asphalt plant established its efficiency by returning its original cost of $20,000 to the City in its first four years of operation. In 1930 it was redesigned at a cost of $25,000 and its capacity increased by 50%. After an asphalt storage tank was installed so that tank car deliveries could be accepted, it could handle the laying of 1500 square yards of two-inch topping a day. By 1938 the plant's daily output amounted to 13,000 tons. In addition to keeping the street work done promptly, it helped to keep the Park Boulevards in good repair at about half the cost of contracted work.

By the mid 1940s the plant began to need maintenance again; for fifteen years it had been kept operating by ingenuity and determination of the crew. In 1945 an unused government surplus plant became available at an installed cost of $75,000 and was purchased. It was able to produce 71,000 tons of asphalt in 1946, which was used to resurface 29 miles of deteriorated brick, stone, concrete and asphalt pavement, many miles of which had been first installed some 40 years before. The new plant was capable of preparing various mixes such as sheet top used for patching where a durable feather edge is necessary, and other special mixes used in the maintenance programs. It produced 66,525 tons of asphaltic concrete for use in the 1950 street resurfacing program, at which time more than 22 miles of deteriorated streets were resurfaced.

In asphalt plant operation, it is generally estimated that a 50,000-ton annual production is needed to justify plant overhead. Seattle was using about 35,000 tons. Reduced production was attributed to the practice of other city departments letting their asphalt work to private asphalt suppliers. As a consequence, and despite departmental objections, the Mayor and Council members recommended a two-year trial closing of the City's plant in 1964. Since January of 1966, asphalt mixes have been obtained on contract from private suppliers on a yearly competitive bid basis.

In 1913 the "Country Club Road" or Greenwood Road was connected with the business district. Pavement was completed from Mercer Street to North 85th Street, following the route of Westlake Avenue North, Phinney Avenue and Greenwood Avenue; the result was a continuous 10-mile pavement from Pioneer Square. Those who advocated the cause of expediency had urged the laying of asphalt over the old plank paving on Westlake Avenue and Melrose Avenue and the construction of a viaduct over Railroad Avenue from the port Commission's Central Waterfront project to connect with Elliott Avenue at Bell Street. In 1913 Broadway was becoming known as "auto row" and the paving of East Pike, East Pine and East Union Streets was considered important.

Better access was desired for the district south of town and a petition was presented for grading and paving Beacon Avenue from Alaska Street to Director Street. West Seattle agitated for a completed California Avenue and all areas were beginning to realize that accessibility was one of the desirable features of any residential district. Paving on California Avenue and Admiral Way was opened for traffic in 1916. As the suburban districts increased in population, their interest in paving and the extension of thoroughfares and connection roads also grew.

The early 1900s were a time of transition from horse-drawn to motorized equipment. In 1915 it cost $7.80 per day including the driver's wages, gasoline, oil, tires, depreciation and interest on the investment to operate a three-ton truck. The trucks carried 26 tons per day for a distance of 30 miles and it was estimated that they did the work of from two to four teams. Six thousand, nine hundred seventy-nine licenses were issued for automobiles and one thousand, three hundred twenty-nine for trucks in 1915. In 1920 automobile licenses issued increased to 44,046. All this had a tremendous influence on city work.

Statistics issued in the annual reports of the Streets and Sewers Department indicated that maintenance of brick, stone or asphalt pavement was considerably more than that of concrete. Table II Chapter 18 indicates how Portland cement concrete and asphaltic concrete climbed to supremacy. One reason for this was that the glacial sands and gravels indigenous to the locality proved excellent for the foundations and mixes necessary; wearing qualities had also been greatly enhanced through improved techniques. Methods of laying both concrete and asphalt paving had been improved and the laying time shortened for both.

Resurfacing programs gradually overlaid the old brick and stone with asphaltic concrete where the road beds were in good condition. Consideration for the horse-drawn traffic remained necessary before 1920 and road surfaces were constructed for use with iron-tired vehicles and iron horseshoes. Armored curbing was installed on Olive Way for use in braking these vehicles.

On July 27, 1919, the first concrete pavement in Seattle was laid on the north side of Leary Avenue (Way) north of 3rd Avenue Northwest; 8″ thick, 18′ wide. (Leary Avenue Paving, LID 3181)

The City laid many miles of sheet asphalt, placed one-inch thick on top of a four-inch concrete base consisting of 1–4–7 concrete, 1 part cement, 4 parts sand and 7 parts gravel. This base was left over-night and then sheet top consisting of a fine mix 100% passing #10 screen, asphaltic content between 11 and 12%, was laid to a depth varying from 1½ to 2 inches. The slipperiness of the resulting surface, the weakness of the base, and the tendency to crack with aging largely offset the alleged economy of this procedure.

Asphalt was customarily laid on streets with grades of less than 6%; brick on streets with grades between 6% and 12%; and sandstone on streets of over 12% grade. Wilkeson sandstone blocks were first used on Olive Way. The Department advocated using surfacing material suitable to the needs of the district and thus effected money saving changes whenever possible. There was no reason to use sandstone on fairly level grades where footing for horses was reasonably secure, but in hilly areas it was grooved on two sides to furnish a firmer, non-skid surface.

Increased traffic and the tendency of drivers to seek the shortest route forced engineers to consider which streets were being most used. There were people who thought 18-foot streets were sufficient in residential areas, chiefly because they required smaller assessments to pay for the improvement. The 25-foot street was satisfactory in strictly residential districts where only two lanes of traffic and one parking lane were necessary; in fact, in 1915 the City Engineer reported that up to that time it had been customary to design all residential streets with a width of 25 feet; and that this width has been standard for residential pavement for many years. Wider streets seem to be conducive to higher speeds and more accidents. It has always been the aim of traffic engineers to plan arterial streets reasonable distances apart, endeavoring to keep "through" traffic out of residential communities.

The first concrete pavement in Seattle was laid in 1919. Until then it was apparently considered not sufficiently durable as a wearing surface, but it was regarded as a good base for the various other materials used as toppings. Several cities in the midwest had begun specifying concrete, putting it down for short term use at first, and covering it before the top was worn. Variations in mix and thickness of concrete and methods of laying and curing gradually improved and it was found that the concrete alone was satisfactory for many years of service.

In 1916 Renton Avenue was surfaced all the way to the south city limits, by grading, planking or paving over its entire length.

An extensive filling, grading and paving project made a continuous thoroughfare of Elliott Avenue and 15th Avenue West as far as the new Ballard Bridge during 1922 and 1923. Prior to that time most of the former street had been on a timber trestle built out into the water, and carrying street railway tracks as well as wheeled vehicles and pedestrians. The high bluff that overlooked Elliott Bay at Denny Way was also cut down in the course of this project, Denny Way being extended to intersect with Elliott Avenue.

By 1920 the City had embarked on a program of developing all the major thoroughfares, and during the succeeding forty years laid down over 600 miles of concrete roadways in residential, arterial and secondary arterial roadways.

In the early 1920s the City was laying an 18-foot strip of permanent paving between the curb and the street railway tracks, with planking between the tracks at the intersections. The Seattle Municipal Railway was required by the ordinance under which the original Stone and Webster street railway system was purchased by the City in 1919 to pay the entire cost of paving and maintaining the portion of the street in which its tracks were laid. This provision was a carry over from earlier practices which customarily imposed this requirement on private street railway companies in return for what were considered valuable franchise rights. By 1920 it had become an anachronism, but the Municipal Railway had been unable to obtain either legislative or judicial relief from this track paving obligation, and was further handicapped in fulfilling this part of its obligations by the stringent provisions for payment of principal and interest that had been written into the 1919 purchase ordinance at the behest of Stone and Webster, and which established a prior claim on monies that otherwise would have gone into maintenance and improvement.[3] Unable, consequently, to put down permanent paving, the Municipal Railway resorted to wooden planking as a temporary expedient; horse and wagon traffic seemed able to negotiate the crossings with a minimum of accidents, but as motorized traffic increased and greater speed developed, the open tracks and planked intersections became known as "death traps." There were many such areas in the city, and after several fatal accidents, the Municipal Street Railway Department turned to the somewhat more satisfactory expedient of placing concrete slabs four inches thick on a sand cushion between the rails and entirely across the 18-foot right of way. The sand cushion was used to level the surface and to minimize rocking of the slabs. The slabs were 18 inches wide and five feet long and were easily removed for repairs on the tracks and ties when required. No alterations to the tracks or rails were necessary before their installation. The cost was less than for standard paving for the same area, and when standard paving was to be laid, the blocks could be removed to other locations, or stored for other uses.

The first street to be laid with the experimental slabs between the street car rails was 24th Avenue North between Turner Way and East Galer Street in the early 1930s; later, under the aegis of the Civil Works Administration[4] slabs were laid on Elliott Ave., 15 Ave. West and 15th Ave. NW as far as N.W. 65th St. The slabs were used until 1940–1941 when the old railway right of way was paved with concrete in preparation for the trolleys and busses. The experiment was successful and many of the slabs were used on the more heavily traveled streets during and after World War II. They were stored after their removal and later were used by the City's crews in the building of the rail and slab retaining walls.

After the First World War many of the residential districts were eager for permanently finished streets and this was an incentive for a greatly accelerated program of paving with Portland cement concrete between the years 1920 and 1929. The 25-foot street width for residential streets was now standard. In more densely populated districts such as apartment house areas, provision was made for 32- or 36-foot widths when they were petitioned for by the owners, who then paid the increased assessments for the construction.

Much early paving was marred by the appearance of cracks along its length and across the roadway. Herbert F. Faulkner and Ben B. Mason, of the Engineering Department Testing Laboratory, are credited with developing the dummy contraction joints, both lateral and longitudinal, which eliminated most of this trouble. These techniques have since been adopted almost universally.

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[3] For further discussion of the Street Railway issue, see Chapter 10 (Public Utilities).

[4] See Chapter 12.

These joints are surface grooves of depths varying with the thickness of the pavement. Normal shrinkage cracks occur at the grooves and the resulting crack helps to relieve stress and provides expansion space, thus eliminating the unsightly random cracks formerly prevalent.

It is also possible to saw expansion joints but the hard aggregates of the Pacific Coast region caused exceptional breakage of saw blades, thus considerably increasing the cost of the joints. However, modern methods and equipment are allowing greater use of this improved technique. Use of the transverse dummy joints during construction prevents the cracks which develop when a pavement is first laid. The longitudinal joint was first employed in Seattle in 1925 when the contractor wanted to pave a 30-foot street on 23rd Avenue Northwest in one operation rather than in two 15-foot strips. After experimentation with varying distances for transverse dummy joints, the interval of 15 feet has become standard. No through joints are made except at the end of the day's pour when the concrete is also thickened at the edge. On panel paving, the joining edges are thickened to provide extra strength against heavy wheel loads. All the paving done in Seattle in 1925 used these new principals and they have been followed generally, except for the location of the through joint and the adoption of the thickened edge. Since 1925 extensive experiments with through joint locations and the proper size of thickened edges have been carried on, using new technical data concerning the properties of concrete, as it is released.

An Eastern concern proposed to patent a concrete control joint but was unable to do so because the local cement association was aware of Seattle's pioneering and had secured from the Department a sample core taken through a dummy joint from one of the streets paved in 1925, which proved that such a control joint was already in use.

Curb doweled to the pavement with steel bars is frequently used in Seattle; this provides a positive bond and allows placing the curb at a later and more convenient time.

Construction in the years of the 1930 depression was greatly influenced by government regulations and participation.

After years of bitter controversy centered around the financial and operating woes of the Seattle Municipal Railway, the city was finally able, in 1939, to negotiate a loan from the Reconstruction Finance Corporation to finance a complete conversion of the obsolete and ailing system to rubber tired transportation. The subsequent reconversion proceeded with unexampled swiftness: the last car making its final run on the last existing route in April 1941. The old equipment was scrapped, but the now-useless rails remained in the streets, their slick surfaces contributing disproportionately to skidding accidents. The fact that scrap steel was urgently needed for the War Effort provided additional incentive for their removal from downtown streets, a project that was begun in 1943 and completed the following year. Ninety-five per cent of the 425 miles of trackage was removed during this period; much of it was taken up by the Steel Recovery Corporation in agreement with the City and the rest by the City. Salvaged rails were disposed of through the War Materials Agency; the City received the ceiling price for the salvaged rails and this sum, with Gas Tax receipts, helped to supply the City's share of funds for the paving and repair work necessary after the rail removal. Some of the rails were retained by the City for use in constructing the previously mentioned rail and slab retaining walls.

In the districts where the War Materials Agency was removing rails, it also repaved the disturbed surfaces along the rail slots, but during the process it was found that the asphalt and brick streets in the downtown area were in such poor condition that it was arranged for the City to do its own repaving under another agreement.

In 1943 and 1944, the City repaved with concrete the 18-foot street raiway section in ten and one-half miles of streets, repaved with concrete six and one-half miles of arterial and business thoroughfares, 17 miles of asphalt, and six miles of stone and brick streets, all in preparation for overall asphalt resurfacing. It was contemplated that by the end of 1946, all the remaining brick pavement would be resurfaced. Very few rails remain in the City's streets but many brick and stone paving blocks that were placed on a substantial base may be found under the various surfaces that have subsequently been laid. Usable space gained by track removal made possible extra lanes of traffic in many cases.

The rapid increase in the number of cars during this time and the introduction of busses and trolleys made it imperative to increase the width of the partially finished streets which had been paved 18 feet along one side only, and those paved on both sides with the 18-foot car track space in the center. In these latter cases, the City paid a portion of the cost, assessments were equalized, and a 54-foot street was achieved. This was accomplished by laying 18 feet of paving on the opposite side from the first strip, filling the car track section with sand and pit run gravel to within two inches of the top and then placing two inches of asphaltic concrete over the entire width of the street. Such streets were also included in later resurfacing programs, and their useful life was extended many years. Southwest Avalon Way from Thirty-fifth Avenue Southwest to Southwest Spokane Street was one of these streets to be so treated and its financial success helped to stimulate the extensive paving program continued after 1948.

Low property valuations in 1946 curtailed street improvements; but this situation was largely overcome by the end of the year; and in 1947 about two million dollars was spent for concrete street and alley paving, sidewalks, watermains and sewers, which were put under contract by means of local improvement districts. In 1946 Boren Avenue from Denny Way to Broadway was widened from 30 to 46 feet and became a major link in a by-pass arterial which connects Rainier Avenue to Aurora Avenue.

In 1948 the effects of the Second World War shortages were being eliminated and Seattle was able to begin a large repair and construction program which was to continue for several years. The 34th Avenue West et al paving project was ordered in 1948 and was an important step in the permanent improvements of the City's major boulevards. The district included portions of 34th, 35th and 36th Avenues West from West McGraw Street to Government Way and two blocks each of two cross streets.

A project identified as Fauntleroy Avenue included a number of short streets amounting to four miles of paving and considerable drainage because of the heavy clay soil in the area.

Fifteen blocks of Northeast 65th Street were widened and paved in 1948, this being one of the last of seventeen large arterial jobs in the seven-million dollar program for 1948. Three miles of paving with sidewalks were ordered on Beacon Avenue. In the Lakewood district northwest of Seward Park streets in 160 blocks were paved. These were representative jobs and for several years the City was occupied in accomplishing what had been impossible during the war years. Seattle was considered to be a leader in advancements made in concrete pavements, and many inquiries are in the files requesting information on various questions relating to paving.

Some of the remaining unpaved streets in the South Beacon Hill district were scheduled for improvement in a project ordered by the Council in April 1962; among these were twelve disconnected sections in the Beacon Hill and Rainier Valley areas.

In a portion of Magnolia Boulevard between West Howe and West Dravus Streets advantage was taken of natural foundation materials, which were overlaid with five inches of aggregate and finished with three inches of asphaltic concrete. With concrete curbs and gutters, this provided a fine appearing boulevard which has shown little or no deterioration since it was opened for use in the fall of 1954.

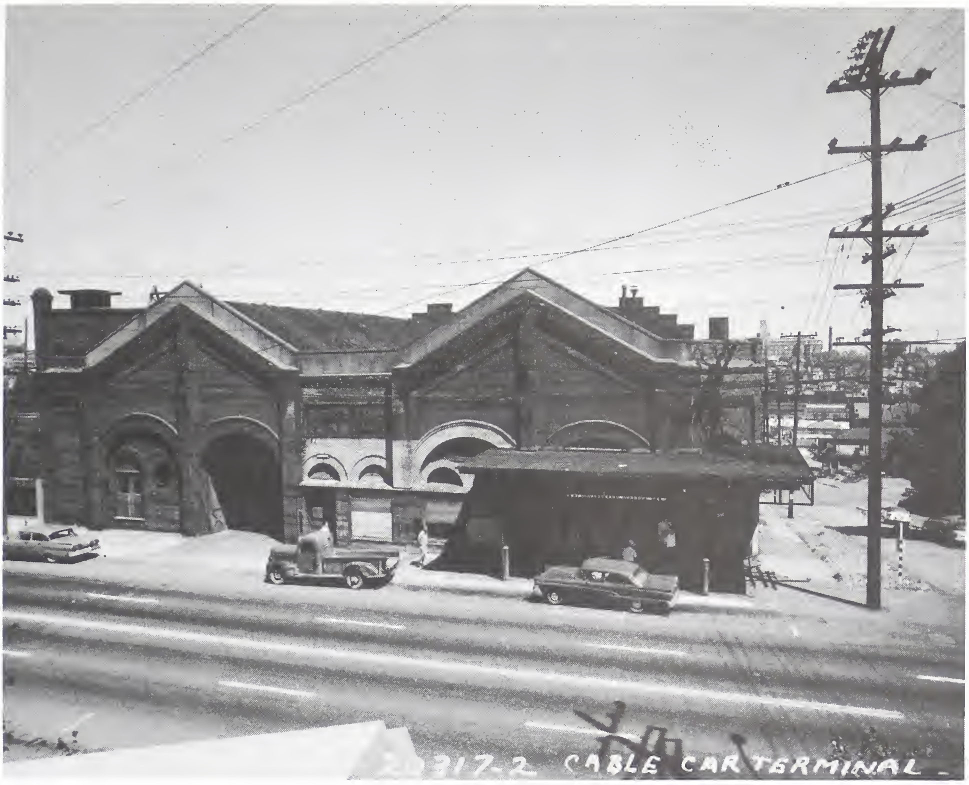
The Engineering Department has been criticized for seeming to favor concrete over asphaltic pavement and in 1949 the City Council insisted that the possibilities of asphalt be explored as a means of saving the taxpayers' money. Subsequently, for a short time, alternate bids were taken on the two kinds of pavements: Portland Cement concrete, and asphaltic concrete. Contractors appeared reluctant to bid on the asphalt alternate and invariably the Portland Cement concrete was the only, or lowest bid, and the choice of the property holders in the several surveys made. The practice of calling for the alternate bids was discontinued in 1957, the expense of preparing the estimates and bids being given as reason enough.

In July 1953, a test strip of rubber asphaltic concrete was laid on Olive Way between Bellevue and Harvard Avenues as an experiment. It had been used in other cities and claims were made that it had greater elasticity, was less susceptible to temperature, required less maintenance and reduced shock and vibration. Its advantages were generally rated by Seattle as not great enough to offset the difference in cost of application. This seems to be the consensus. The problem of securing right of way where it has not been provided is well exemplified by the case of the Ballard-University Crosstown Highway, from Market Street to North 46th Street, which was mentioned in 1928 when the Engineering Department had been first requested to submit an estimate of cost for connecting the Ballard and University districts by a surface highway or by a tunnel through Phinney Ridge. It was concluded that the surface route was most feasible both as to grade and as to finance. The matter seems to have been dropped until a 1943 report indicated that the street would take portions or all of 73 lots and one unplatted tract. There were houses to be moved or abandoned. Many of the intersections with the new highway would be closed off and other access provided for private property affected. Bulkheading along the northerly side of the street and some of the private property abutting the street would add to the total cost. In 1946 a resolution was passed to proceed immediately with condemnation and construction of the Ballard-University Highway. There had been no street on the route of the proposed highway, which was finally established from North 46th Street around the lower part of the ridge, (practically parallel with Northwest Leary Way) to make a connection with Market Street between Fourth and Fifth Avenues Northwest.

An appropriation of $200,000 to pay for this improvement was authorized by Ordinance 77717; it was divided between condemnation and construction, and was approved February 3, 1949. In 1948 the name of Market Street was proposed for the improvement and its completion made the street continuous from Seaview Avenue to Greenwood Avenue. The Street Naming Program of 1962 added the Northwest designation to the new portion of the street.

GRADE SEPARATION

The conflict between increasing vehicular traffic and railroad usage was becoming particularly acute in the south-end industrial district. A Grade Separation Commission, authorized by Ordinance No. 56190 in



E. James Way, extending James Street from Broadway to a connection with E. Cherry Street, was financed by the Street Fund and was constructed late in 1960 as part of a project that entailed widening Cherry St, and in the process it wiped out a landmark of unusual historical significance. The James Street Cable Railway barn, the oldest such structure then standing, and the sole survivor of the pre-Stone and Webster era of street railway operation in Seattle, had to be razed to make way for the new thoroughfare. Shown here is the barn as it appeared May 11, 1950 shortly after having been vacated by the Department of Public Health, which had used it as an office and storage area during a decade or so following the abandonment of the street railway system; and as it appeared in July 1960, just before being demolished.

October, 1928, submitted a report dated May 31, 1930 outlining locations and costs of several grade separation plans to be jointly financed by the railroads and the City. Of these, structures along Airport Way over the Argo Yards (1928), First Avenue South (1935), and Fourth Avenue South (1933), and along Spokane Street (1943) have been constructed in the years indicated.

SLIDE PROTECTION

Rail and slab bulkheads have been constructed at several places within the City, their purpose being to prevent or contain sliding areas or to serve as sea walls. The sliding slopes along the north side of Jackson Street were supported by rail and slab construction, some of which are still in place. Another rail and slab bulkhead supports the toe of the hill along Southwest Admiral Way which climbs over the ridge toward Alki Point. A concrete crib bulkhead was used near the top of this hill. Stretches of the rail and slab construction help to keep the tides from pounding the shores at Alki Beach at the old Luna Park site; at Emma Schmitz Park, a viewpoint on Beach Drive between Southwest Oregon and Southwest Snoqualmie Streets; and on Beach Drive to protect the Alki Treatment Plant shore. The bulkhead at Emma Schmitz Park is between six hundred and seven hundred feet in length; the others are shorter.

The first rail and slab bulkhead was built along Dexter Avenue below the Aurora Bridge in the late 1940s and is a good example of construction for this type of slide protection.

ALASKAN WAY VIADUCT

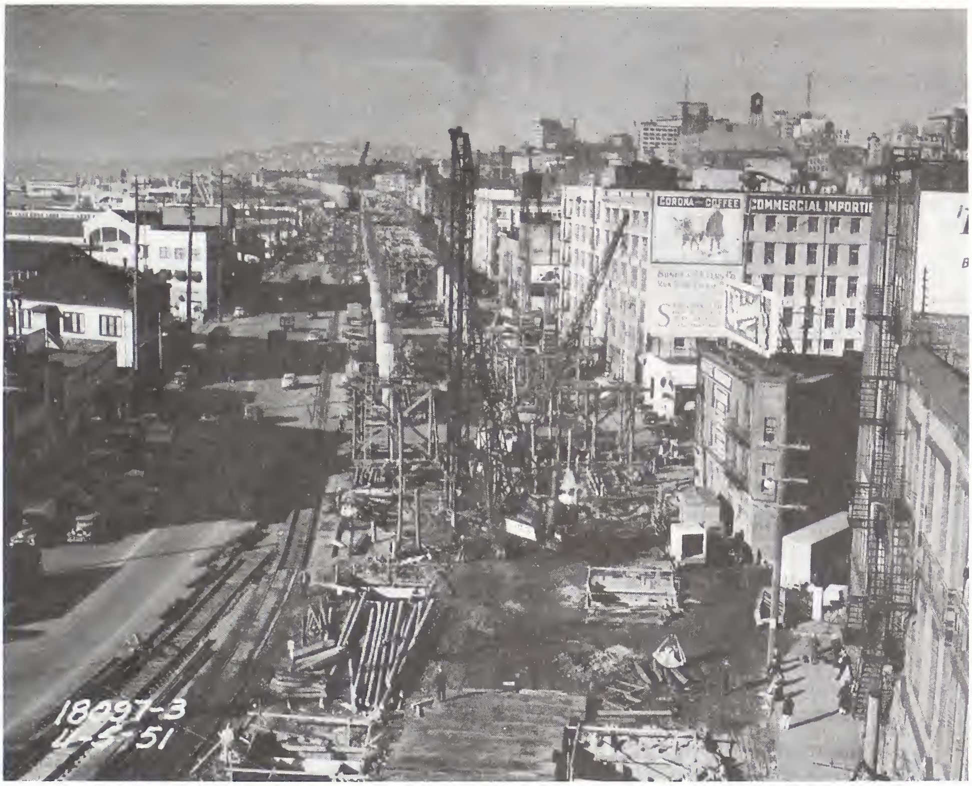
A traffic survey in 1938 revealed that 211,000 vehicles entered and left the area between Jackson Street and Lenora Street west of Eighth Avenue during a 12-hour period. This was a tremendous increase in the decade following 1922, and indicated need for traffic relief.

Seattle's post-World War II commitment to the motor age can be said to have begun in earnest with the Alaskan Way Viaduct. Design work began to take shape in 1948, when test borings for the foundation were made, and plans were completed for the first and second units. In November, a drawing of the proposed viaduct was released for publication in the local newspapers, and illustrated talks were subsequently made to service and industrial groups regarding benefits and advantages which it would help bring about.

The structure was primarily intended as a by-pass route to divert traffic flow around the City Center rather than to encourage the flow of automobiles into the downtown core. This objective, which coincided with a major tendency in urban highway design during this era, was reinforced by the unique transportation pattern imposed by Seattle's "hourglass" shape and by its heavy traffic between the north-end suburbs and the south-end industrial districts. Of secondary consideration was its impact upon the neighborhood through which it passed.

As Alaskan Way Viaduct was to be part of the State Highway system, bids on the first unit were opened in Olympia on December 20, 1949. Reinforced concrete was favored over steel for the construction of this facility, and the Bureau of Public Roads finally agreed to its use.

The viaduct as first planned encroached upon railroad franchise rights, sometimes by as much as the width of two tracks. Track adjustments and



Alaskan Way Viaduct during construction North from Yesler Way April 5, 1951

relocation being necessary, plans and later construction details were modified. The railroads were reimbursed for half their costs for these operations, a procedure not usually endorsed by the City.

The first unit of the Alaskan Way Viaduct opened to traffic on April 4, 1953, was built in four contracts.

1st—First Avenue and Battery Street to Alaskan Way and Pike Street, with single- and double-deck section along center of project.
2nd—Double-deck section from Pike Street to King Street.
3rd—Viaduct from King Street to Dearborn Street and ramps into First Avenue South.
4th—Tunnel, Battery Street from First Avenue to Aurora Avenue.

The cost of this multi-million dollar improvement was prorated between the Bureau of Public Roads, the State Highway and the City. Much of the City's share consisted of design work, acquisition of right of way and engineering costs.[5]

[5] The later construction of the Seneca Street off-ramp in 1961 and the Columbia Street on-ramp in 1966 were entirely City expenses.

The Alaskan Way Viaduct is 7,600 feet long. It was built with two 40-foot roadways with three traffic lanes each way; 58,867 yards of concrete were used; 7,460 tons of reinforcing steel; 472 tons of structural steel; 171,410 linear feet of piling. The mercury vapor lights on the upper deck, spaced at 120-foot intervals, produce an illumination of 1.0-foot candles, while fluorescent lights on the lower deck, at 60-foot intervals, provide 1.7-foot candles of illumination on the roadways. Emergency telephones on each deck at 1,000-foot spacings are connected to the police system.

The Alaskan Way Viaduct extension south from Dearborn to West Hanford Street, completed and opened to traffic on September 3, 1959, involved many conferences with the five railroads which had yards and tracks in street area under franchise agreements. Exchange of properties became necessary and tracks had to be moved and relayed. Agreements for adjusting trackage were ratified in October 1955. Layout plans had been completed in June and as this also was a State Highway construction job, financed jointly by Federal aid and State funds, a contract with the State Highway Department was concluded in December 1958. The Seattle Engineering Department developed preliminary designs and secured the right of way for the facility.

The combined units of the Alaskan Way Viaduct-Battery Street Tunnel have added over four and one-half miles to the highway system and have absorbed a good share of the north-south commuter traffic by the late 1950s.

Scarcely had the forms been stripped off the last portions of the original Alaskan Way Viaduct when agitation began for a series of on and off ramps to the downtown area. The crucial shift from the earlier concept of urban "by pass" expressways to freeways which serve the cores of metropolitan areas had been anticipated by the designers of the Alaskan Way Viaduct, who had included provisions for the future construction of four access ramps. Only two were actually built, an "off" ramp at Seneca Street in 1961, and an "on" ramp at Columbia Street, opened February 1, 1966. Funding for both projects was from the 1960 Bond issue and from the 1954 Arterial Bonds.

A delegation of officials from Tokyo visited Seattle in the early 1960s, seeking information concerning the tunnels. Several years later a folio of pictures of the Chiyoda Tunnel in Tokyo was sent to the City Engineer. The Chiyoda Tunnel embodies some of Seattle's tunnel building principles, and the pictures indicate how the ideas were employed in the much larger Tokyo construction.

STREET TREES AND OPERATION TRIANGLE

In 1959, Seattle was readying for its 1962 Century 21 World's Fair, and Citizen Advisory Groups proposed lining 3rd, 4th and 5th Avenues with trees from the Central Business District to the Fair Grounds. When trees of the selected species were donated by Weyerhaeuser, the Council placed responsibility for planting and maintenance in the hands of City Engineer Morse. Public acceptance and appreciation has been good, and has grown along with the trees. During 1966, proposals were made by Seattle Natural Beauty Associates, the Central Association, and other citizen groups that a City-wide program of planting street trees be undertaken. Ordinance No. 95594, approved March 9, 1967, placed the continuing program of beautification and air and environment improvement with the Engineering Department. Under L. Wayne Johnson, Landscape Architect, 16,000 trees had been planted along many thoroughfares by the end of 1975.

With the impetus of beautification of street areas provided by the trees along 3rd, 4th and 5th Avenues, public and private enthusiasm turned in 1962 toward landscaping of some of the odd-shaped parcels in street areas. These highly visible orphan islands were seen as real opportunities to change weed-infested patches into areas of tranquility and beauty.

Again, the City Council put this program under the City Engineer, with Wayne Johnson in charge. A proposal for an All City financed program was turned down by the Council, and the program languished. Picked up by the Womens' Division of the Seattle Chamber of Commerce and given the name "Operation Triangle," they proposed in 1965 joint government and private support and funding. Strong and continuing support has come from Garden Clubs, private business, Community Clubs and individuals. Leadership was provided by Mrs. Kathy Nelson and much expertise on low-maintenance plantings came from Mrs. Pendleton Miller and Horticultural Societies.

Fifty Triangles involving low-maintenance plantings have been built in all parts of Seattle.

FREEWAYS

Prior to 1947 there was no state law to restrict access to any highway. A natural result was the strip development as, for instance, that along the Tacoma-Seattle-Everett section of U. S. 99, which affected capacity and safety of the highway, destroyed its value as a free flowing, high capacity, through route, and subsequently prompted the State Legislature to declare:

"Unrestricted access to and from public highways has resulted in congestion and peril for the traveler. It has caused undue slowing of all traffic in many areas. The investment of the public in highway facilities has been impaired and highway facilities costing vast sums of money will have to be relocated and reconstructed. It is the declared policy of this state to limit access to the highway facilities of this state in the interest of highway safety and for the preservation of the investment of the public in such facilities."

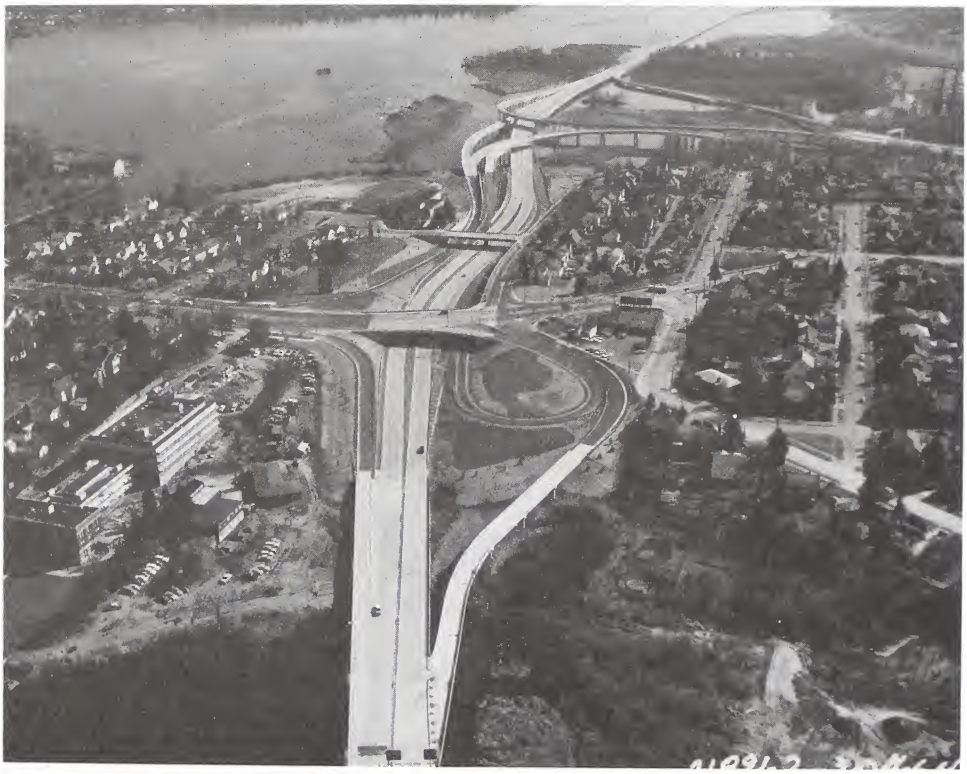
Subsequently, important routes have been constructed as limited access freeways.

The new limited access highway (Interstate 5) superseded in importance U. S. Highway 99 between Tacoma and Everett. In some areas construction followed the route of older roadways and added additional width of roadbed to the original right of way. In most areas, however, Interstate 5 occupies an entirely new right of way and U. S. 99 is bypassed.

The route of I-5 through the Central Business District follows the early adopted plan along Sixth Avenue, which location had been proposed by the Department twenty years earlier as a by-pass arterial through the CBD.

Interstate 5 right of way belongs to the State. Design and construction were under supervision of the State Highway Commission, and maintenance is carried out by the State Highway Department.

The Evergreen Point Bridge and its connection to Interstate 5 (Roanoke Expressway) was built by City, State toll road and Federal funds. Right of way was purchased partly by the City and partly by the State;



The Roanoke Expressway link, which was financed out of the 1954 and 1960 Street and Arterial Bonds. The partially completed Arboretum Interchange, and its link to the ill-fated R. H. Thomson Expressway is clearly visible. March 24, 1964 construction was also shared between the City and the State. The connection begins at Interstate 5 at the Roanoke Interchange and passes through the north portion of the University of Washington Arboretum; thence by the bridge, which is a toll facility, across Lake Washington to a tie-in with Interstate Highway 405. The Seattle Engineering Department participated in the project to the extent of designing and constructing a traffic interchange between the new facility and Montlake Avenue, and an overpass at 24th Ave. East to serve the Museum of History and Industry, built at the north end of the Arboretum in an area now named (Horace W.) McCurdy Park.

The entire project, plans for which were approved late in 1961, was completed in about two years. The public attitude toward these bridges and the location of the highways is a far cry from that expressed concerning the first Lake Washington crossing when it was believed that populations east of the lake would never justify a bridge. Twenty-four hour average weekday traffic on Mercer Island (Interstate 90) in 1972, was 52,300 vehicles; that of the Evergreen Point toll facility was 43,600 vehicles.

THE R. H. THOMSON AND BAY FREEWAY CONTROVERSIES 1946–72

A point alluded to in the conclusion of Chapter 18—that the approaches and methods which worked in the past will no longer suffice to meet the problems of the present and future—was forcibly brought home to the Municipal government, and to its Engineering Department in 1972. The Bay Freeway had been favored by the civic forces aligned with it as an urgent requirement to break up the daily commuter traffic stalemate on Mercer Street and to improve accessibility to events held at the Civic Center. Opponents dubbed it a "Chinese Wall" blocking off forever the south end of Lake Union, and a further incentive to dependence on the automobile. On February 8, 1972, it was repudiated by the electorate by a decisive 55% "No" vote. The even more controversial R. H. Thomson Expressway, given a kind of quietus two years before when it was removed from the City's Comprehensive Plan, had been officially laid to rest by an even more significant 70% "No" vote.

The roots of the problem, and the source of what was eventually to blossom as public enchantment with the private automobile, go back at least to 1916, when the first piece of legislation authorizing Federal participation in highway construction was passed by the Congress. Additional Federal highway legislation, passed in 1921, and authorizing Federal cooperation with State highway construction, further established the pattern of commitment to the needs of motor transportation and, as a corollary, a neglect of public transportation, whose decline can be dated approximately from the immediate post-World War I era. By 1945, America appeared ripe for a virtually total commitment to private motor vehicle transportation. Hard hit by the Depression, and granted only a temporary reprieve by wartime conditions, public transportation, whether railroad, street railway, interurban car, or bus, gave unmistakable indications of being headed toward an irreversible decline. During the immediate post-war years, auto production boomed and urban thoroughfares became ever more congested. A number of closely inter-related factors were at work here: Post-war prosperity, fueled first by reconversion and then (after 1950) by a cold-war economy, boosted living standards for most Americans, and brought the automobile within easy reach of the majority of families; the new affluence, and the increased mobility and status striving that resulted from it, dictated an ever increasing use of and dependence on the automobile; and this, in turn, generated a way of life that was reflected in a new type of community organization in which public transportation came to seem increasingly irrelevant. The resulting pattern of urban and suburban development, obvious to everyone by 1955, had been discernible much earlier to civic officials entrusted with solving of transportation problems. Convinced, like so many others at this time, that the trend of the future was inescapably toward increasing dependence on private cars, and likewise convinced that present and future transportation needs could be taken care of by building limited access highways along the most heavily traveled routes, the Seattle Engineering Department began a comprehensive origin and destination study early in 1946 to ascertain where such facilities could most advantageously be built. Supplemented by traffic projections based mainly on extrapolations from updated traffic counts, the data gleaned from this study formed the basis of a comprehensive plan for urban arterial corridors. The study was completed in 1947.[6]

War-time and ever-increasing post-war traffic congestion had made obvious the need for a plan of this sort. What was not nearly so obvious, and what was not to become so for many years, were the far-reaching social and environmental implications of the decision to direct all efforts toward the accommodation of growing motor traffic in these corridors.

The basic choice having been made—or rather, forced by circumstances and the absence of any comprehensively formulated alternative—it became imperative, if the City center was to remain viable, that first priority be given to the movement and storage of automobiles downtown. The immediate result was the metropolitan arterial and expressway system incorporated in the City's Comprehensive Plan adopted in 1957, after many public hearings. The passage in 1956 of the Federal Highway Act, and the beginning of work on the Seattle portion of Interstate 5, gave a tremendous impetus locally to limited access facilities.

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[6] Further details on the Seattle Metropolitan Freeway System may be found in J. R. Robertson's article in "Street Engineering," September 1959.

The Federal Highway Act authorized an initial appropriation totaling 26 billion dollars for the construction of the proposed Interstate Highway System; established a 90%–10% ratio of Federal to State funding for the program; established a standard presumed to be adequate for anticipated traffic in 1975; set up procedures for public hearings prior to the determination of routes through cities or other incorporated populated areas; and inaugurated a Federal Highway Trust Fund, into which all Federal taxes on gasoline, motor vehicles and auxiliary equipment, including tires and diesel oil, were to be channeled, and the monies from which were to be used exclusively for the financing of the highways.

The Highway Act was passed by Congress and signed into law by President Eisenhower in August 1956. For a piece of legislation destined so profoundly to affect the quality, direction and cohesiveness of American life during the next few decades, it received very little publicity; and such comment as was forthcoming was almost exclusively favorable.

Indications pointed to the need for better roads. Motor car registration mushroomed; traffic congestion passed from severe to acute to catastrophic; railway and urban public transit declined precipitately; and region after region found itself dependent increasingly on motor vehicles and highways. Almost overlooked was the vigorous popular protest (in 1959) in San Francisco over the Embarcadero Freeway, that eventually halted that project, and that signaled the beginning of the "freeway revolt."

Originally dubbed the "Empire Expressway," there was envisioned a third north-south limited access arterial skirting the shores of Lake Washington, which represented a proposal that had been made as far back as the late 1920s. As a component of the proposed urban freeway network, it got underway in the mid-1950s with the construction of a 52-foot roadway on Empire Way for several miles through the southeasterly portion of the City. The Comprehensive Plan continued this link as an expressway facility extended north through the Central District, the Arboretum, under Union Bay via a tunnel, and thence north to about 145th Street.

The initial design of the new facility was unveiled to the public October 4, 1959. In July of 1959, a traffic origin and destination study program was instigated to update the findings of the 1947 study. Jointly carried out by the Engineering Department, the Bureau of Public Roads, and the State Highway Department, it developed data justifying east-west circumferential loop ties to supplement the basic north-south throughways and the need for cross-lake routes to connect downtown Seattle with the burgeoning eastside suburban complex. This system, as presented on the City's Comprehensive Plan, was expected to provide adequately for motor transportation needs through the year 1985.

Effective criticism of any aspect of either the national or local highway programs was still in the future as 1960 dawned and the time for a decision on the financing of the Empire facility approached. An agreement between the State and the City, executed in mid-1959, had placed the proposed route on the State Highway system. Local funding was necessary to match a proposed Federal subsidy, the estimated amount was included in an omnibus highways bond issue that was submitted to the Seattle electorate on March 8, 1960. Amounting to $11,128,000, the "Empire Expressway Bonds" included additional allocations for an expressway route along Shilshole Avenue, four ramps connecting the Alaskan Way Viaduct to downtown Seattle, and an extension of the Spokane Street viaduct westward to a connection with Harbor Avenue Southwest. An additional bond issue of $1,925,000 to help finance a viaduct along Mercer Street was approved at the same election.

Thus funded and ratified by the voters of Seattle, the Empire Expressway Project, renamed the R. H. Thomson Expressway July 3, 1961, Ordinance Number 90358, proceeded and plans were developed to the point where a preliminary outline of the facility could be made public.

But even as the City was laying its plans before the public, the early aura of civic unity and support on the freeway-expressway issue was beginning to dissipate; and the time when such projects could be initiated and planned to the accompaniment of a unanimous chorus of approval was fading into limbo. Faced with mounting resident opposition, the City was forced, early in 1961, to propose a series of alternate routes for the Empire (R. H. Thomson) Expressway. By the summer of that year, the Engineering Department had worked up preliminary designs for four routes through the area north of Union Bay. At issue was not only the problem of minimizing dislocation and disruption in residential neighborhoods, but also of preserving the University of Washington Arboretum—an invaluable resource of botanical knowledge as well as a unique island of serenity and natural beauty. Unfortunately, the two goals were found to be difficult, if not impossible, to reconcile.

Another source of criticism had already begun to make itself felt by mid-1961. This, it will be recalled, was the era when I-5 was pushing its way toward the heart of the City, and a bitter controversy was raging between proponents of the "big ditch" versus the "covered mall" concepts of urban freeway design. The latter, energetically pushed by local architects such as Victor Steinbruck and Paul Thiry, inevitably spilled out into the dispute over the design for the R. H. Thomson Expressway.[7]

Its emphasis, at that time, was not so much on opposition to urban freeways per se, nor on agitation for any major alternative to them, but rather, on the impact on community integrity and general urban environment. Local critics believed that if architects and others primarily concerned with social and environmental values could have a hand in the design of urban expressways, such structures could more nearly be made compatible with the societal and environmental needs of the areas through which they passed. But though local criticism of freeway construction was beginning to mount, the time was not ripe for a realistic consideration of alternatives; and several years were still to pass before public opinion would become mobilized to the point of forcing a reappraisal of the ultimate public needs for urban freeways.

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[7] The "big ditch" concept ultimately prevailed, with the energetic backing of the State Highway Department, which claimed that the expense of the "covered" alternative was prohibitive, and that it was not acceptable under Federal funding guidelines.

The swelling chorus of criticism eventually stirred sympathetic echoes in Washington. In 1962, legislation was enacted to require urban areas to establish comprehensive transportation plans in order to qualify for Federal Highway funds. To alleviate another acute problem that had arisen in the wake of extensive urban freeway construction—the totally inadequate provisions incorporated in the original 1956 Act for financing the relocation of displaced individuals and families—State Highway programs were "invited" to participate in relocation and advisory assistance programs. Neither of these enactments proved to be more than palliative to the major social and environmental problems that urban expressway construction was creating; provisions for compensating homes and businesses taken by freeway construction continued to remain inadequate and to serve as a major fuel of anti-freeway agitation until somewhat more nearly adequate provisions for meeting the needs of dislocated families and businesses were enacted in 1968.

The Century 21 Exposition, held between April 21 and October 21, 1962, at the new City Center, generated traffic volumes locally that soon equaled peak morning and evening commuting traffic. Little noted were the unexpected successes of the new monorail in providing transportation between the Fair and downtown, and one of the Seattle Transit System's major north-south line—#15-15th Avenue Northwest—rerouted early that year from Elliott Avenue to Mercer Street and the Fairgrounds.

Meanwhile, preliminary design work on the R. H. Thomson Expressway, beset by increasing protest and litigation, continued intermittently during the first half of the 1960s. Little progress in settling on the most feasible route had been made since the initial announcement of the four-alternative route facility three years before. By 1963, citizen protest and legal actions had brought active planning for the facility to an almost complete halt.

The earliest opposition to urban freeways, as indicated earlier, had been centered around the design and location of individual projects, rather than on principled opposition to the basic concept of extensive urban expressway construction and over-emphasis on automotive transportation.

Beginning around 1965, generalized opposition began to surface as anti-freeway articles appeared in the literature.

Economist George Shaw Wheeler said:[8]

"Ordinarily an automobile used in commuting carries only one or two persons with safety, requiring spaces between vehicles that must increase as the speed of movement of the vehicle goes up. A good highway can move from 1200 to 2500 persons per lane per hour past a given point and requires at least nine times as much space for the highway right-of-way as is required per passenger moved by electrified train or subway with platform level loading and unloading of passengers. Such a train or subway can move 25,000 or more (some claims are up to 40,000) seated passengers per hour per line of track. Even the trolley bus or auto bus that does not have its own right-of-way and must compete with the automobile traffic—is about four times as efficient in the use of street space—as the private automobile, and on urban freeways it is about seven times as efficient." (U. S. Department of Commerce, Rationale of Federal Transportation Policy, 1960, pp. 52–3)

The highway establishment responded quickly. Studies sponsored by the Automobile Manufacturers' Association, the Rand Corporation and Wilbur Smith and Associates purported to show that rapid transit was an excessively rigid and inflexible mode of urban transportation as compared with automobiles and freeways. The heavy guns of this counter-attack were provided by a volume by John Meyer, John Kain and M. Wohl entitled "The Urban Transportation Problem." (Harvard University Press, 1965).

The relatively rigid and limited suburban development dictated by the equally rigid and unadaptable rail rapid transit of former years had given way to the dispersed and decentralized growth pattern made possible by the flexibility and convenience of private automobiles. However, freeways designed to accommodate anticipated traffic demands for decades were found to be overcrowded only months after completion. In Seattle, I-5, which was designed to cope with the anticipated traffic flow of 1975, was found to be overcrowded within a year after its completion.

In interchange between the R. H. Thomson Expressway and the Interstate 90, in the form originally proposed, would have required the displacement of homes and businesses directly affecting more than 4,000 central City residents, thus forcing Seattle to confront one of the most troublesome and potentially explosive of all the social problems that large scale urban freeway building had created. The issue was, as critic A. Q. Mowbray later phrased it, of "white highways through black bedrooms." On September 10, 1967, the State, concurring with Mayor Braman, agreed to shelve the proposed interchange, at least temporarily, and to confine its acquisitions to land needed for the I-90 route.

[8] George Shaw Wheeler, "The Crisis in Transportation" reprinted from Czechoslovak Economic Papers, 1965, by the Committee for Rapid Rail Transit, Seattle.

In any event, it had become apparent, as the year 1967 faded into history, that any full-scale freeway through the Thomson corridor was out of the question, and that the future of even a modified and reduced roadway was problematical, at best. In an attempt to effect a compromise, and to do as much as possible to make the roadway compatible with the integrity of the community, the City engaged the services of the San Francisco Architectural firm of Okamoto & Liskamm to work out an urban design concept to that end.

Three years later, after two proposals for regional rapid transit had been turned down by the voters, and bowing to the increasing public resistance to freeways, on June 1, 1970, the City Council voted to officially remove the R. H. Thomson facility from the City's Comprehensive Plan.

One of the projects approved at the March 1960 election had been an elevated highway over Mercer Street between Eastlake Avenue and the Seattle Center, as part of the original arterial system along Broad and Mercer Streets, included in the Comprehensive Plan. Active planning for the Bay Freeway did not get underway until 1966, when a design team including Perry Johanson, leading architect, was formed to blend the new expressway with the physical environment. The final design, with strong official and business community support, was brought to litigation by the anti-freeway forces. On February 8, 1972, special election, both the R. H. Thomson issue and the Bay Freeway were decisively defeated by the voters.

At stake had been not merely two expressway projects, but the entire thrust of urban transportation planning for three decades, involving acceptance of the public demand for ever-better facilities for the automobile. The question raised in 1972, and still pertinent in 1975, is: Where to go from here? The traffic muddle on Mercer Street is still present. Whether the ultimate answer will involve increased emphasis on public transportation systems is yet to be determined.

BATTERY STREET TUNNEL

Construction of the Battery Street Tunnel encountered difficulties over the problem of ventilation. The Bureau of Public Roads held out for forced draft ventilation on the grounds that the conditions were the same as in the subway to the Liberty Tunnels in Pittsburgh and in the New York's Park Avenue Vehicular Subway, in both of which places it had been found essential. Members of the Bureau considered mechanical ventilation, which would have increased the cost of the tunnel another million dollars, to be essential regardless of cost, and recommended the setting up of carbon monoxide sampling points at 400–500-foot intervals, these to be connected to automatic fans. The City held tests to prove that the gases discharged by the cars were hot enough to rise to the surface rather than to settle into the ventilating slots. The State agreed with these tests and indicated that the open grill work made forced draft ventilation unnecessary. But the Bureau then contended that the open grill work on the street surface over the tunnel would become blocked with snow and would interfere with ventilation, and that the melting snow and rain would run down on traffic below, flooding the tunnel. The Bureau insisted that curbs be placed around the grill work; desiring, in addition, drains around the grills to connect with the drainage system; subsequently it relented slightly on that point.[9]

After a delay of two years and a refinancing of the unit, the State and City built the Battery Street Tunnel, sharing the cost. The tunnel was opened to traffic July 24, 1954; traffic was then able to use the Alaskan Way Viaduct to about Jackson Street, with the tunnel extending 2,100 feet from the northerly terminus of the viaduct, under Battery Street to Aurora Avenue which is part of U. S. highway 99. The tunnel walls are painted a light color, and the two roadways in each direction are illuminated with 7.5-foot candles on the pavement—which during the daylight hours is automatically increased at the entrances to equalize the interior with the daylight outside. "Subway Closed" and "Detour" signs are located north and south of the entrances and, with the "Stop Motor" signs in the tunnel, are operated manually from the central control room whenever required. Telephones at 325-foot intervals are connected with the control room or police department, and an automatic sprinkler system operates in case of fire. As a safety measure it was ultimately supplied with 72 axial flow fans which are capable of changing the air every two minutes. This system operates only when carbon monoxide in the air reaches a concentration of two parts in 10,000, and is controlled by a carbon monoxide sampler which operates continuously at eight locations in the tunnel.

Following are excerpts from a "Sidewalk Superintendent's Handbook" printed by the Portland Cement Association:

A SIDEWALK SUPERINTENDENT'S HANDBOOK FOR THE BATTERY STREET SUBWAY

Construction of the Battery Street Vehicular Subway will provide the connecting link between the Alaskan Way Viaduct and Aurora Avenue. The north end of the completed viaduct passes over Western Avenue. From here the four-lane roadway will curve to the east into Battery Street entering the subway and passing under all of the north and south streets from First

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[9] To comply with Bureau requirements, the City installed the curbs around the ventilators but in such a way that they were easily removed after the tunnel was completed; they served no practical purpose and were a traffic hazard on the street surface.

Avenue to Sixth Avenue, where it will curve to the north again just missing the southeast corner of the P. I. Building, continuing under Denny Way and finally emerging in the center of Aurora Avenue.

The subway will consist of two roadways separated by a center wall. Each roadway will be 25 feet wide with a 3-foot emergency walk on one side and will carry two lanes of traffic in one direction.

A contract for the construction has been awarded to Morrison-Knudsen Company, Inc., on their low bid of $2,384,061. Construction work will require 18 months for completion. Because of the necessity for keeping north-south traffic moving, including several transit lines, only two of the seven intersecting streets will be closed at any one time and each of these for not more than three months. Construction is by the open cut method and the sequence of construction will be done in stages.

BATTERY STREET SUBWAY STATISTICS

Length: 2134 feet.
Capacity: 2–25 foot roadways—2400 vehicles per hour each direction
Excavation: 131,000 cubic yards.
Concrete: 19,140 cubic yards.
Steel Piles: 1,100 tons.
Reinforcing Steel: 850 tons.
Ventilation: 72 axial flow fans, 15,000 c.f.m. each, 3 h.p. motors. Complete air change every 2 minutes.
Carbon Monoxide Control: Continuous sampling and recording from 8 points. Automatically starts ventilation fans at CO concentration of 2 parts per 10,000.
Lighting: Fluorescent lights provide 7.5 foot candles continuous lighting. Entrance lighting maximum 100 foot candles during sunlight hours.
Sprinkler System: Automatic sprinklers, dry pipe, deluge type in eight sections operated by heat responsive devices.
Fire Extinguishers: 2–20 pound capacity Dugas dry chemical at 325 foot intervals.
Fire Hose Outlet: 2 standard hose connections at 325 foot intervals.
Escape Doors: Emergency escape doors between roadways at 325 foot intervals.
Emergency Telephones: Emergency telephones at 325 foot intervals connected to central control chamber and police system.
Traffic Control: "Subway Closed" and "Detour" signs at entrance and "Stop Motor" signs in subway controlled from central control chamber. Directional signs on Aurora Avenue and on the Alaskan Way Viaduct.

Finances:	Contract Cost	$2,384,061
	Piling furnished by State	132,000
	Subsurface investigation and design	79,000
	Engineering, Contingencies and Sales Tax	244,510
		$2,839,571
	Cost is divided as follows:	
	State Highway Department (Motor Vehicle Fund)	$1,298,571
	City of Seattle	$1,541,000
		$2,839,571

PARKING

In connection with the development of the highway system and the increasing traffic in the City came the problem of parking. The 1936 report of the WPA Projects and the Traffic Survey of the City of Seattle had warned of the decentralization of the business district if off-street parking was not provided for customers.

In an attempt to make more general use of parking spaces available on street area, the Traffic Division installed 1600 parking meters in the Central Business District in 1942 between January 1 and April 3, 1942. Enforcement began February 6, and continued as meter installation progressed southward. Maintenance ran rather high until imperfections in the clock mechanisms were corrected and the public accepted the fact that only the correct coins would work in the meters.

The meters paid for themselves during their first year of operation and accumulated a balance which covered maintenance and collection expense. Parking meter income was subsequently channeled into the General Fund. A 25% to 30% increase in street parking space resulted from installation of the meters, and the enforcement problem was also minimized. The 1963 Annual Report shows that approximately 8% of the parking meter revenue was expended for their maintenance, and subsequent reports state that revenues continued to exceed installation and operation.

A 1945 survey estimated that 25,594 parking spaces were available on the streets of the City. There was talk of an ordinance requiring all new buildings to provide parking and unloading space in proportion to the square feet of floor space in the building; another ordinance, to require existing buildings to make the same provision within a given time, was proposed but never enacted into law.

The Commercial Club in the University District asked for a survey and recommended that 175 meters be installed in the University commercial district. Additional meters were requested for the fringe of the Central Business District to be supplied as needed.

Planning in 1950 included a parking garage on the Public Market site, but nothing came of this.

Seattle's zoning ordinance—No. 86300—first suggested by Traffic Division in 1945—became effective on July 24, 1957, and required that parking and unloading space be provided in proportion to floor area in all new buildings in the City. And in November of that year a contingent of parking meter checkers (known colloquially as "meter maids") were employed by the City, thus relieving police officers from checking overtime parking violations.

In 1961, the Legislature gave the City the right to develop and operate parking lots, but only after first calling for bids from private operators. A case in point is that of the Seattle Center Garage, which was built under contract for the City's Building Department. The property belonged to the City, and it was hoped that returns from the parking operation during the Fair in 1962 would greatly reduce the debt incurred in its building. Even though the City pays no taxes, a private bidder for use of such facility must include in his bid a sum equal to what the tax would be, as it is not considered desirable for private enterprise to profit in such a manner from tax supported investments. The bids must also include a proportionate share of the total cost of facility depreciation distributed over a given number of years. The operating personnel for the facility and the number of cars parked regularly and at peak times are other factors to be considered, as well as a suitable return to the operating company. When all items are considered, the fee for parking could easily be exorbitant. However, the City must call for bids every three years, and if there are no bidders, or if a bidder defaults on his contract, then the City may operate the facility until the next bid date.

Seattle Freeway, I-5, belongs to the State, but agreements between the City and the State allow the City to use the space beneath it and to issue the required permits and franchises. The Park Department has landscaped portions; private parties operate parking and storage areas, but the same regulations regarding light and air, harmful installations, payment by Contractors in lieu of taxes (as mentioned above) and a sum sufficient to amortize any investment by the City must be met. City employees desiring to establish parking spaces under the Freeway would be subject to the same regulations as any other private parking contractor.

Parking spaces under the Alaskan Way Viaduct are regulated by State law and City ordinance as to restriction of light and air, and disturbance and/or detriment to the facility. Parking on the street surface is regulated by the installation of meters which are under control of the City. Many applications for private use of the space for private parking facilities, including pigeon-hole parking, have been made, but were denied for the reason that the City has no right to rent this space to private parties except as previously mentioned.

ROADWAY STANDARDS

A design standard study made in 1949 by the Bureau of Governmental Research of the University of Washington, in cooperation with the Association of Washington Cities and the Design Standards Committee of the State, defined the various types of streets as:

Major Arterials

Transportation arteries connecting focal points of traffic within a City. Arteries providing communications with other communities and outlying areas. Arteries having relatively high traffic volumes compared with other streets in the City.

Secondary Arterials

Routes which serve lesser points of traffic interest. Provide communication with outlaying districts or collect and distribute traffic from major arterials to local streets.

Access streets are land service streets, generally limited to providing access to abutting property. They are tributary to the major and secondary thoroughfares and generally discourage through traffic.

These standards were incorporated into legislation in Chapter 164 of the Laws of 1949, and approved on March 16, 1949. They have been revised subsequently by the Design Standards Committee as provided for in the 1949 law, and differentiation between cities of less than 1,500 population and those larger, has been made.

The City had 1,465 miles of streets in 1965. These streets are designated as freeway, expressway, parkway and major arterial streets; as community arterial and neighborhood collector streets; and as access streets—commercial and residential, depending on the purpose they serve and the amount of traffic they carry. Minimum widths and pavement thickness are prescribed.

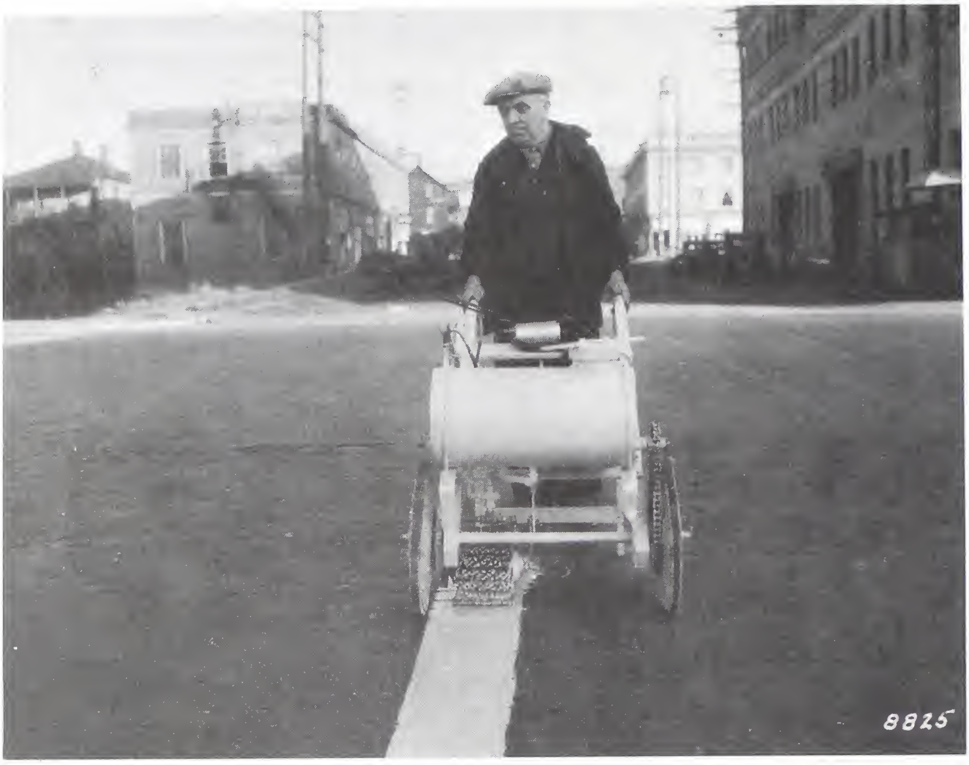
CHAPTER 7

Traffic And Related Topics

THE office of Traffic Engineer was established by the Civil Service Commission July 15, 1930, but the position was not formally recognized by the Council until January 1, 1935. During this time the Traffic Division was part of the Streets and Sewers Department and there is little information concerning its first years of operation. Both the Traffic Department and Streets and Sewers Department were put under the jurisdiction of the Engineering Department in 1936, as the result of a revision of the City Charter. That problems created by automobile traffic were by then becoming a paramount factor in street planning and engineering is attested by the fact that during the 15-year period between 1922 and 1937 the number of motor vehicles increased by 211 per cent, as against a 22 per cent increase in population.

A traffic map of 1935 shows that the City had one six-lane highway on the southern portion of East Marginal Way and one on Aurora Avenue from Denny Way to about North 70th Street. The other principal thoroughfares were four lanes. All the highways funneled their traffic into the downtown district and there was really only one route, consisting of Aurora Avenue, Fourth Avenue and Fourth Avenue South and East Marginal Way, that was more or less continuous between the north and the south city limits. Empire Way, which was the City's extension of the Sunset Highway, and Rainier Avenue both dumped their traffic into Jackson Street or Dearborn Street and left it to find its way northward as best it could.

A traffic survey made in 1936 in connection with Works Progress Administration strongly urged a by-pass route to move through-traffic past the central business district. Even at that time it was realized that limited



Paint-striping machine developed by Hugh J. McGee, Superintendent of Shops & Equipment, Department of Streets & Sewers. Civil Service Journal—June 1932

access streets would accommodate nearly twice the number of cars per lane per hour as would a normal arterial street.

The report largely confirmed an earlier survey made by the Department, and its conclusions coincided with those of several other street and planning surveys and reports that had been made for the City through the years. As a result of this survey the Department recommended that streets should be widened as much as possible using available land owned by the City, condemnation proceedings being used as far as possible for the facilitation of access to connecting streets. It was proposed that Valley Street, Fairview Avenue North and Eastlake Avenue, which comprised the thoroughfare around the south and east part of Lake Union north to Fuhrman Avenue, be widened to 76 feet.

An interesting sidelight about Lake Union: When airplanes were first recognized as a means of transportation, the suggestion was made that Lake Union be drained, filled and leveled off for a landing field—what would be more convenient than an airport right in the heart of the City? Fortunately, that idea didn't take hold, and development around the Lake has seen much diversity, from industrial uses to parks.

According to the Kroll Atlas in 1966, Westlake Avenue from Aurora to Valley Street has a right of way of 150 feet; Valley Street from Westlake to Fairview Avenue has a 120-foot right-of-way; Fairview Avenue from Newton to Fuhrman Avenue, a 100-foot right-of-way. Eastlake Avenue has a right-of-way of 75 feet, and the paved roadway portions of these streets vary from 46 to 56 feet. Yesterday's streets are inadequate; today's may prove likewise, and increased traffic demands may require increasing widths as financing becomes available and concepts change. But whether ever-increasing automobile traffic can be accommodated on existing thoroughfares—or, for that matter, on new ones—without seriously disrupting and downgrading the neighborhoods through which they pass is a complex problem for which no really satisfactory answer seems to be in sight.

The early 1940s were World War II years and military and defense activity multiplied and complicated the City's traffic problems. The population in 1941 increased by 52,000. Vehicle traffic added 10,000 more cars daily through the central business district. Jay walking and other traffic infringements became a big problem for the police. Cross walks were ignored and courtesy was conspicuously lacking. Truckers demanded downtown loading spaces for loading and unloading. Working out these problems required the combined efforts of all interested parties and agencies and also the first long range comprehensive plan for use of street spaces. Results of the meetings between these parties disclosed among other facts, that most of the loading and unloading took place between traffic peak hours, using part of the bus zones. A skip-stop system was accordingly developed for buses; no parking was allowed on north-south avenues between seven and nine o'clock A.M. and only trucks could use the curb space during those hours. Removal of street car traffic from First and Second Avenues in 1941 gave room for increased traffic on those streets and additional lanes were provided on Alaskan Way. Motor buses and trackless trolleys had replaced street cars by 1941; channelization continued; and the installation of 1600 automatic type parking meters in the Central Business District marked, as indicated in the preceding chapter, the beginning of metered parking in the City.

The Boeing Company constructed the first 5,000-car parking space in 1941 and this took practically all the parking off the impossibly congested portions of the highways in the vicinity. Seattle-Tacoma Ship Building Company and the Associated Ship Builders also provided off-street parking spaces. Traffic signals were installed in the Boeing area. A traffic signal blackout program was set up at the request of the army authorities and recruits were trained so that an entire district could be blacked out within ten minutes.

Prior to 1926 it was generally believed that through traffic must be allowed to progress through the City center. Parking at the outskirts of the City with jitney bus service to the business area was suggested as a means of relieving downtown congestion, but nothing came of this. By 1949 Fourth

Avenue was carrying the largest number of vehicles through the Central Business District during the peak-hour traffic, and according to a Bureau of Public Roads and Seattle Traffic Engineering Study, the street was overloaded by nearly 20%. Various expedients were tried, one being the rerouting of transit buses, but with only a given number of streets to carry the increasing numbers of cars, nothing helped for very long at a time. In 1955 the one-way grid system was first put into operation. There was a terrific outcry against it, but a public information director was given the task of informing the people of its advantages and disadvantages, and many were persuaded. In the ten-year period which ended in 1965, vehicle registration increased almost four times as fast as the population.

The Bogue Plan of 1911 had anticipated this traffic jam and had offered suggestions for preventing it and for expediting the traffic. The traffic problem then was to find the shortest distance between the City center and the outlying districts and to keep the streets on a grade of not more than 3%. These factors, distance and grade, were most important when the majority of vehicles were horse drawn.

The Bogue Plan had recommended, among other things, 6 traffic tunnels, forty feet in width and with a dwarf wall to separate the street car track from the roadway.

> The Day Street tunnel was to be located between Lake Washington and Dearborn Street, 1600 feet in length.
>
> The Union Street tunnel from the intersection of Ninth Avenue and Union Street to East Spring Street and Eleventh Avenue.
>
> The West Seattle Tunnel on what was then known as Highway No. 39, southwest from West Edmunds Street for about 1000 feet. This would enable a traffic street in the Longfellow Creek district to connect the West Seattle area to downtown by a shorter route along Airport Way, and at the desirable 3% grade.
>
> The Interlaken Tunnel was to burrow 300 feet underneath North Broadway Hill and bring the Union Bay district a half mile closer to downtown.
>
> The Spokane Street Tunnel was to provide access from Rainier Avenue and Lake Washington to the Harbor Island area and West Seattle, shortening the four and three-quarters mile distance to less than two miles. It would require two tunnels, 6,000 feet long, the other one 1,600 feet. Ferries were recommended as a temporary solution to the transportation problem to Harbor Island.
>
> The Blanchard Street Tunnel would carry heavy traffic from the waterfront to the intersection of Westlake Avenue and Virginia Street, a distance of 2380 feet.[1]

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[1] More complete details are given in the Arterial Highways Section of the Bogue Report.

Keeping records of the various kinds of traffic accidents and their causes has been a continuous part of the Traffic Division's work. The greatest numbers of accidents were caused by:

Collision with another motor vehicle,
" with a pedestrian,
" with a fixed object,
" with a bicycle;
failure to yield right of way, exceeding speed limit, following too closely, improper turns, and driving under influence of alcohol.

In 1936 the largest percentage of accidents was caused by cars entering intersections after the warning light showed, or before the green light appeared, and by approaching a red light too fast for the vehicle to stop in time, according to the traffic report.

In 1966 the common causes of accidents fell into this order:

right-angle collisions
rear-end collisions
hitting parked car
improper turns
sideswipe and head-on collisions

In 1966 failure to yield right of way and rear-end collisions accounted for almost one-half of the accidents, and hitting parked cars accounted for one out of six. The same infractions continue to cause the greatest number of accidents.

Increasing population and car registrations have added to the number of the City's accidents but the percentages have remained low. Cutting off and rounding corners on many streets has made turning easier and safer. Widening has been accomplished by cutting down or eliminating planting strips and sometimes by narrowing sidewalks.

POPULATION AND VEHICLE REGISTRATION—20-YEAR COMPARISON TABLE

	1955	*1965*	*Change*	*1975*	*Change*
Population	555,000	567,000	+ 2.2%	503,500	− 11.2%
Vehicle Registration	245,000	343,600	+ 40.2%	433,075	+ 26 %
North-South Traffic (Alaskan Way to 6th Avenue, Inclusive)	136,000	208,500	+ 53.3%	164,500	− 21.1%
Canal Bridges	199,500	272,000	+ 36.3%	351,263	+ 29.1%
Traffic Accidents	20,248	19,822	− 2.1%	22,082	+ 11.4%
Traffic Fatalities	38	80	+ 110.5%	49	− 38.8%

Population figures from Seattle Planning Commission. Vehicle Registration figures from R. L. Polk and Company

TRAFFIC SIGNS

The first electrically controlled traffic signal was installed at Fourth Avenue South and Jackson Street on April 1, 1924. It had been designed by J. W. A. Bollong, the City's first Traffic Engineer. By 1936, there were 103 traffic signal controlled intersections in the City. Eight of these were in the financial district on Second Avenue at Marion Street, Spring Street, Cherry Street and Columbia Street; and on First, Third, Fourth and Fifth Avenues at Columbia Street. These signals provided for heavy pedestrian and vehicular traffic across Second Avenue and through the financial district across heavy north and southbound traffic. The controls for these signals were set up in the basement of the County-City Building and the latest equipment available was installed. Provision was made for all future signals south of Madison Street. It was the aim of the crew to get any damaged signals back into operation within half an hour if at all possible. Signal material was manufactured in Seattle, which saved time in repairs. Thirty-five flashing beacons were installed on heavily travelled arterials.

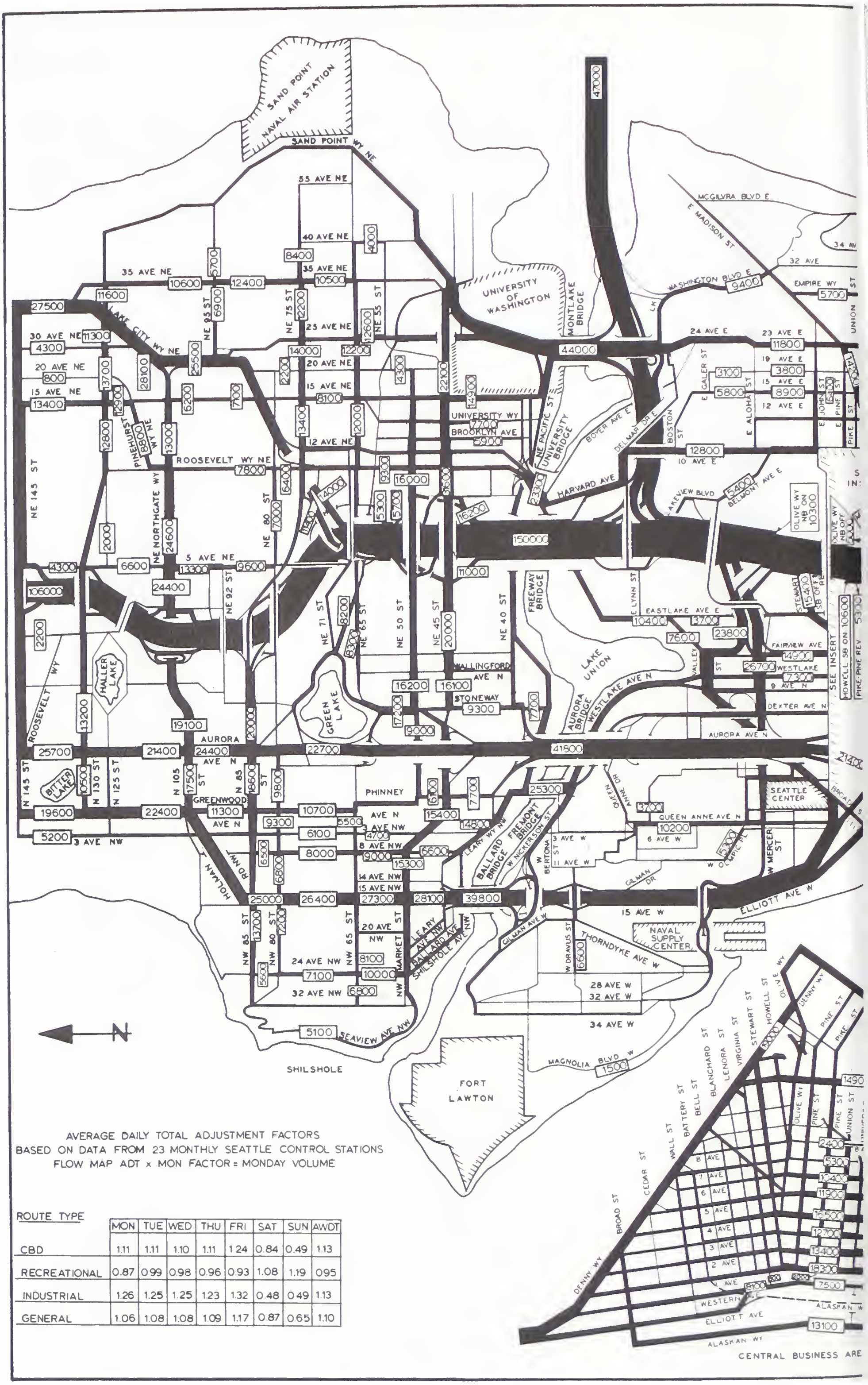
The first traffic actuated signal in the State was installed for experimental purposes at 20th Avenue Northeast and East 65th Street in 1938, costing the City only the installation labor. East 65th Street was a heavily traveled street and 20th Avenue Northeast was the approach to the University from the Bothell Highway.

A four-phase, fully traffic actuated, quad-turn signal was installed on Aurora Avenue North at North 105th Street in 1964. There were six in the entire country at the time, and two of them were in California. In 1965, another step forward was made with the installation of solid state controllers at 150 intersections in the Central Business District. The master control is actuated by the approaching traffic that passes over or under detectors. These are known as "traffic actuated" signals and they meet the standards of Uniform Traffic Control Devices for Streets and Highways. Comprehensive signal studies determine the locations for such signalization.

CHANNELIZATION AND SIGNS

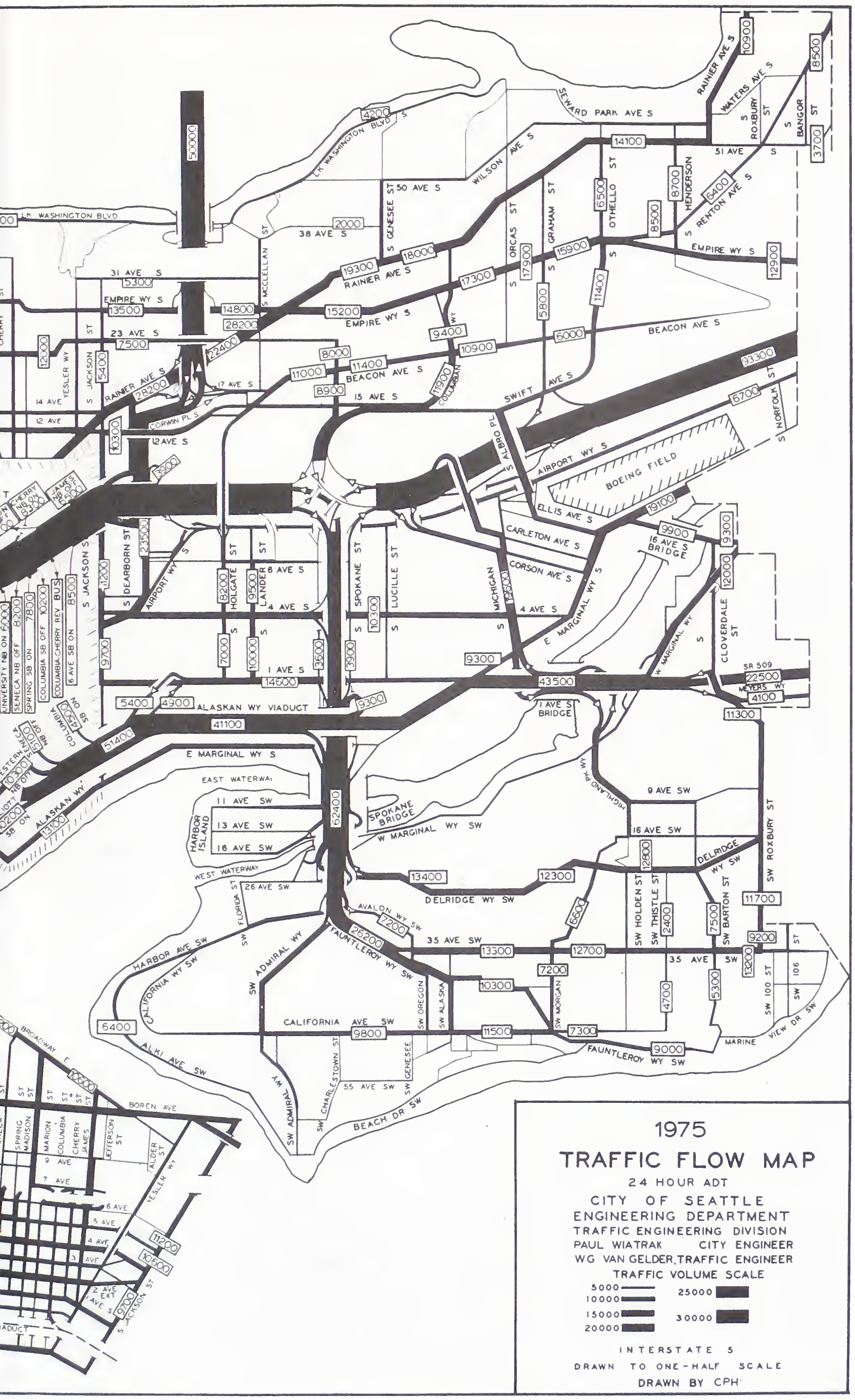
Seattle has many intersections that present undesirable conflicts and hazards to both motorists and pedestrians and that also confuse and disorganize traffic flow. Many such intersections are improved by channelization. Button markers are used in some locations: concrete curbs, traffic islands and special safety lighting are other means employed. One of the most important safety measures is the painting of lane lines. During 1949,

Seattle Traffic Flow Map 1915



AVERAGE DAILY TOTAL ADJUSTMENT FACTORS
BASED ON DATA FROM 23 MONTHLY SEATTLE CONTROL STATIONS
FLOW MAP ADT x MON FACTOR = MONDAY VOLUME

ROUTE TYPE	MON	TUE	WED	THU	FRI	SAT	SUN	AWDT
CBD	1.11	1.11	1.10	1.11	1.24	0.84	0.49	1.13
RECREATIONAL	0.87	0.99	0.98	0.96	0.93	1.08	1.19	0.95
INDUSTRIAL	1.26	1.25	1.25	1.23	1.32	0.48	0.49	1.13
GENERAL	1.06	1.08	1.08	1.09	1.17	0.87	0.65	1.10



1975

TRAFFIC FLOW MAP

24 HOUR ADT

CITY OF SEATTLE

ENGINEERING DEPARTMENT

TRAFFIC ENGINEERING DIVISION

PAUL WIATRAK CITY ENGINEER

WG VAN GELDER, TRAFFIC ENGINEER

TRAFFIC VOLUME SCALE

5000	▬	25000	▬
10000	▬		
15000	▬	30000	▬
20000	▬		

INTERSTATE 5

DRAWN TO ONE-HALF SCALE

DRAWN BY CPH

776 miles of 4-inch lines were painted, establishing an annual operating standard for the department. White traffic lacquer was used for the cross walks and yellow for the directional lines. The City's testing laboratory was working on formulas for longer-lasting paints.

Every year in March or April, the paint crews begin the job of restoring the pavement markings. The seven crews consist of two men each with their mechanical equipment. In 1965 they applied 16,192 gallons of white rubber-base traffic paint on arterial streets. This is equal to 776 miles of 4-inch lines. Some of the City's 400-odd miles of arterial streets are painted more than once annually, especially if traffic is heavy. Parking lines and double lane lines where turns are to be considered are also painted. Gallons of paint is a better measure of extent of the paint job than mileage; some years it runs more than 16,000. Even though the quality of paint is continually being improved, more permanent line markings are sought and the button markers are showing a desirable permanency which will eventually amount to a saving as their installation gradually supplants the use of paint. Pedestrian crosswalks are painted first, followed by lane lines, center lines, approach lines, stop lines, the crosshatch areas between parking meters, and shadowed channelizing islands. School crosswalks are repainted during August so that they are freshly marked for the beginning of the school year.

Paint crews usually return to street sign work in October and are occupied with that program until the following March or April when the painting job begins all over again.

All the City's signs are made in the Traffic Shops and a five-year replacement program for the entire 120,000 signs maintained in the City is the aim of the department. Many signs are refurbished in anticipation of future use.

Special events require extra time and attention. One of the regularly recurring events is Seafair, which requires placing of over 4000 portable signs each summer.

Seattle's safety record has been noteworthy as a result of its traffic program and the City has received National Traffic Safety Awards in recognition of significant achievements in accident prevention among both pedestrians and auto traffic as surveyed in cities of comparable size. It was among the top three for the 10-year period from 1955 to 1965, winning national recognition every year as long as the awards were given. It has the best record of maintaining a high degree of traffic engineering standards.

The Traffic Engineering Shop was established in new quarters at Charles Street in the spring of 1967. This is the only move since the shop was first opened in the Fremont location about 1929 when it was operated by the Streets and Sewers Department.

MOTOR VEHICLE TESTING STATION

Automobile safety had become a vital concern by 1936. New cars on the highways were rare during the 1930 depression years, and the many older vehicles deteriorated gradually into critical and dangerous condition almost without the owner's realization of its happening. Old cars were blamed for, and caused, accidents and a strong sentiment developed in many cities toward traffic safety.

The Motor Vehicle Testing Station was the City's solution to the local safety problem. The Traffic Code was amended by the City Council when it passed Ordinance No. 66188, March 31, 1936, and made it compulsory for owners of motor vehicles to submit them to safety inspection once every six months. The Council provided for construction of a testing station and funds to operate it, and placed it under the jurisdiction of the Board of Public Works with administration by the City Engineer. It was located on Valley Street between Boren and Terry Avenues on property that had once been occupied by an early garbage incinerator.

Daily capacity of the testing station was 2400 cars and the required six-month quota was 107,000 cars in order to make a complete check every year. The clerical force was sufficient to keep the records and to get out the notices for test appointments.

The station began operation on December 3, 1936, for voluntary inspection and as something of a training period before beginning the official program on January 2, 1937. 16,000 voluntary inspections were made during the month, 43% passing on the first trip through. 93% finally passed, some of the cars having to return three and four times. This made the total number of cars inspected approximately 22,000 in December. Causes for rejection were unequal brakes, defective tail lights, defective wheel alignment, miscellaneous defects such as license plate, mirror, horn, rain swipe, reflectors. Many cars had several causes for rejection.

Ordinance No. 66188 had provided that owners should be notified by mail when to bring their cars for inspection, and the compulsory program began January 2, 1937. The ordinance had stipulated that the test should include inspection and testing of brakes, lights, signal devices, windshield wipers, rear vision mirrors, reflectors, steering mechanism, wheel alignment, tires, mufflers, exhaust systems, draw-bars, fifth-wheels, towing devices, and such other equipment and appliances as were required by State Law and City ordinance.

By July 1, 1937, at the end of the first official period of its existence, the Seattle Safety Testing Station recorded approximately 82% of the 110,000 automotive vehicles in Seattle. 90% of those notified to appear for inspection presented their cars. Of the 170,000 vehicles inspected in 1937, less than 40% passed the first time through; 40% went through twice before passing; 15% required three trips; and 6% required four or more trips through the station before being given final approval. These extra trips made it necessary for the Station to inspect a total of 300,000 cars. 32 items that might impair safe operation made a total of 6,000,000 individual checks for the year.

The station was considered responsible for preventing many serious accidents by showing owners the major difficulties such as broken springs, tie rods, king pins and other items that could have caused accidents under certain conditions. In the first six months 250 cars were found with defects of which the owners were not aware, and which might have put the vehicle out of control at any moment. Carelessness of repairmen was brought to light and inferior parts were found in strategic places. Evidence was found of indifferent, careless, callous and irresponsible owners, operators, repairmen and manufacturers. Many cars had no certificate of registration or ownership and a large percentage of drivers had no license.

The National Safety Council reported that cities in which a testing station has operated show a decided decrease in traffic accidents and inquiries came from many large cities countrywide requesting information on the operation of Seattle's program of car testing. Seattle's own traffic fatalities decreased about 15% in 1937 from the 1936 record.

The 1937 Legislative Session enacted a provision for Statewide testing of motor vehicles, thus overlapping and duplicating many of the functions of the Seattle testing unit. This development, fueling the inevitable resentments which the local program had generated among motorists who had hitherto been subjected to no such controls and restrictions, brought about a movement to discontinue the local testing station; and the issue came to a head in October 1937, when a proposal to abolish the Seattle Testing Station was brought before the City Council. In the debate which ensued it transpired that the station had been operating at a loss, or at best just breaking even during most of its existence, although Assistant City Engineer Harold E. McMorris successfully refuted accusations of extravagance and waste that some of the more vocal opponents of the program had made. A last-ditch effort by Councilman De Lacey to save the Testing Station by submitting the issue to a popular referendum was blocked by the Council; and on December 30, 1937, the Board of Public Works formally announced the termination of the Seattle Testing Program, and the summary dismissal of the 41 City employees who had been employed by it. On March 20 of the following year, the State Highway Department officially took over the Seattle Testing Unit.[2]

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[2] For additional information on this phase of the history of the Motor Vehicle Testing program see the Clipping File, "Motor Vehicles" in the Seattle Municipal Reference Library.

CHAPTER 8

Seattle City Light in Its Relations with the Engineering Department

THE early charter provision that the City Engineer should be responsible for design and construction supervision for all City Departments took the Engineering Department into their affairs to a greater or lesser extent. One such department was City Light. Before its separation in 1931, the Engineering Department had an interesting share in the development of the early power plant installations of the City which are now under the jurisdiction of Seattle City Light.

R. H. Thomson first came to Seattle about 1879, and worked at surveying and engineering in Eastern Washington as well as in and around Seattle, before he was appointed City Surveyor in 1884. He had long believed that water power was placed on earth to make life easier for mankind. Conditions in the Puget Sound country stimulated his interest in water power and a trip to the Snoqualmie Falls area in 1887 increased his determination to provide for the use of this power. Hydraulic turbines in Oregon City, Great Falls, Montana and New Westminister, B.C. drew his attention, and he traveled as far as California to learn all that he could about their operation and of their use as a means of generating electricity.

In 1892, Thomson was appointed City Engineer under the new charter and was soon faced with the problem of supplying street lights for the growing City. His early interest in electricity was good preparation for establishing an electric power plant on the Cedar River after the water supply had been provided, in accordance with Charter recommendations. He and his assistant studied their notes and made plans and designs, and by 1902 had a report ready for the City Council. The chosen site was below the Falls on Cedar River. The plans included an estimate for city installations and a distribution station which was later built on Yesler Way near the foot of

Seventh Avenue. The plans were accepted, an ordinance passed to provide funds, and the City got into the electric power business in earnest.

The site for the dam was located about a half mile below Cedar Lake. (Renamed Chester Morse Lake, 1956) The best bid on lumber for the dam and construction was $35 per thousand feet delivered at the rail head at North Bend. Two million feet of lumber was needed and the dam site was at least three miles further up the river valley from the rail head. Permission was secured to build a short railroad over which the Engineering crew hauled the necessary saw mill machinery by donkey engine to the power site at the end of the lake. The mill was set up and was used to cut the lumber for shelter for the workers, storage of the mill machinery and all the lumber that was needed for construction of the dam and the staves for the water pipe, doing this at about a third of the bid price; the mill was then sold at a profit. Engineer Thomson had a small crew to install electrical equipment for the power plant as it arrived, and in 1904, one of the generators was placed in operation.

L. B. Youngs was, at that time, Superintendent of Light as well as of the Water Department, and he had requested a Council-appointed assistant and construction chief to serve under Thomson and to act as field assistant to Mr. Youngs. This appointment was made and in June, 1902, J. D. Ross joined the City crew as an assistant engineer in charge of electrical installations on the Cedar River.

Current from the Cedar River plant began to supply the City's street lights on January 10, 1905, and although the construction crew was inexperienced in electrical installation and there were many loose connections and unsteady foundations, the plant worked. A well-trained electrical engineer was put in charge of the plant and all the discrepancies were finally corrected and the adjustments made so that the plant was in good order and operating safely. Its first purpose was to furnish power and electric light for the City's eleven light circuits. Few private consumers were accommodated with electric power before 1905, but in 1911, when J. D. Ross was installed as Superintendent of the newly established Lighting Department (separate from the Water Department) the plant was earning twice as much as its expenses. Cost per kilowat hour has dropped continuously since 1905.

This was the beginning of Seattle's electric power system. In 1911, about the time he ended his long first period as City Engineer, Thomson urged that the City should be able to offer industry and business an abundant supply of cheap power. It was his belief that the cheapest possible power would secure the largest possible return for the money invested, that the City should control a sufficient amount of power to fix the lowest rates consistent with sound financial practices, and that this should be accomplished without any tax burden. Such also appears to have been the conviction of J. D. Ross.

By 1911 the Cedar Lake power plant was proving to be insufficient and search began for supplementary sites. An investigating party surveyed the possibilities of the White River in April 1912, and the Lake Cushman area was studied in October. An auxiliary steam electric plant was also recommended. This installation was completed on Lake Union by the Building and Light Departments in 1917.

There was great rivalry between the public and private power in tests in those days when private power was gaining a foothold, and the private companies quietly bought up the available power sites on Lake Cushman and the White River; but in the scramble they apparently overlooked the fact that the time allowed them to begin construction of the Skagit River had expired, and Mr. Ross, backed by the Mayor succeeded in securing the necessary rights and franchises from the Federal Government by signing personally for them, using his own money and borrowing some from a friend to make the trip to Washington, D. C.

He next had to convince the City Council and the Federal officials that the City needed the Skagit and that the private company had forfeited its claim thereon. Permission to develop the Skagit arrived on December 25, 1918, and the rivalry was finally resolved when the private company was purchased by City Light in the 1930s. To gain friends for the Skagit Project, Ross inaugurated tours and excursions up the Skagit River Valley to the dam site; these quickly developed into elaborate weekend outings during the late 1930s, and drew in almost equal proportion students of engineering and lovers of spectacular scenery.[1]

Ultimate development of the Skagit was contemplated in a series of three jobs, beginning with the diversion dam and tunnel at the Gorge Creek location. This was started in 1919 and the first generator began operation in 1924.

In 1920, the City Engineer's report stated that increase in private and municipal power development in the preceding twenty years amounted to almost twice the percentage increase in population and that the public power output exceeded that of private power. The report showed that cost of municipal power was decreasing, that the Skagit system had paid for the construction of its first unit, and it had set aside capital for retirement of bonds. The Engineer assured the City that the Skagit power plant would not be a tax burden; that, in fact, it was adding to the City's wealth. The Skagit River Railway was completed between Rockport and Newhalem in 1920; the extension to the site of the Gorge Dam was completed a little over a year later. Enthusiasm over the Skagit project was increasing, and the growing realization that future development on the river would decrease the cost per kilowatt brought further satisfaction to the department.

Work on the Gorge Creek Diversion Dam had progressed in 1923 to the point where it was feasible to equip a substation at East 75th Street and Eighth Avenue Northeast. This was accordingly done, and its operation commenced May 1, 1923.

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[1] See next footnote.

A special Skagit Engineering Commission was retained in 1924. Commissioners were Major Joseph Jacobs, W. Chester Morse (who served as City Engineer during critical stages of Diablo Dam construction), and Sterling B. Hill. Their report, filed November 9, 1925, with the City Council, recommended a three-plant development of the Skagit, involving construction of dams and power-houses at Gorge, Diablo and Ruby (later changed to Ross), the detailed program of development covering the 25-year period from 1926 to 1951.

Development of the Skagit moved slowly above Newhalem because of the difficult terrain in the construction area, which became a formidable problem as work on the Diablo installation progressed. Right of way had to be acquired and means of transportation provided, and this meant carving roads over mountains where nothing but trails had existed before, as well as building an inclined railway to haul carloads of supplies and material, equipment, employees and food up a mountain side by means of a counterbalanced system for a distance of 600 feet, where it was conveyed by an isolated electric railway[2] system to construction sites hanging along the edges of the canyons or perched on narrow ledges blasted out of the rock.

Use of the Constant Angle Arch type of dam offered the advantage of considerable saving in concrete. The right to build this type of dam at Diablo was therefore purchased, and the company controlling the patent agreed that its engineers would serve as consultants during the construction. Federal license was authorized October 10, 1927 and work progressed on the tunnel and penstocks and other machinery installations and transmission line extensions. Completion of the Diablo Dam was set for September 1, 1930.

A bitter political dispute in 1930 and 1931 indirectly provided the occasion for a major shift of responsibility between the Engineering Department and the City Light organization. Because of its unusual historical interest, the following contemporary account of the origin and outcome of this imbroglio is here *quoted in extenso:*[3]

"On Monday, March 9, 1931, Mayor Frank Edwards of Seattle removed J. D. Ross, Superintendent of the City Light Department. This was on the eve of the regular municipal election, which turned in large measure upon the issue of municipal ownership. Three councilmanic candidates were regarded as warm supporters of municipal ownership, and the other candidates as lukewarm. The election had special significance because of a pending initiative measure which would give to the Lighting Department charge of its construction. Heretofore this work had been under the Engineering Department of the city. The advocates of the initiative measure pointed to lack of cooperation between the two departments, the delays in construction, and the lack of definite fixing of responsibility for carrying on the engineering work; while the opponents charged that it would make the City Light Department a super-government. J. D. Ross, Superintendent of the Department for twenty years, and regarded by many citizens as the "father" of City Light, strongly advocated the change. It was first submitted to the Council for consideration, and being voted down, was placed upon the ballot by a popular initiative.

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[2] This was known as the Ross Dam Contractor's Railway. A separate system, with no connection with the Skagit River Railway, it used a single electric locomotive (in the latter five years of operation Steeple-cab No. 250, formerly of the Mount Vernon-Bellingham Division of the Pacific Northwest Traction Co.) and was abandoned in 1954.

[3] Joseph P. Harris, POLITICS AND SEATTLE'S MUNICIPAL LIGHT SYSTEM, *National Municipal Review,* July 1931. Pages 407–410.

ROSS' REMOVAL CARRIES CHARTER AMENDMENT

"The removal of Ross on the eve of the election startled the city. Why was it necessary to remove him at this particular time? What connection did his removal have with the councilmanic election and with the initiative vote upon giving the Lighting Department control of its engineering work? Mayor Edwards' opposition to the charter amendment was known, and it was generally interpreted as a move to defeat this proposal. If so, it was an unwise move, for the charter amendment, which according to unofficial polls was due to be defeated, after the removal of Ross was passed by a narrow majority. Ross, upon hearing of his removal, promptly arranged for radio time on one of the local stations and went on the air that night asking the public to vote for the amendment, regardless of whether he was at the head of City Light or not. The councilmanic election resulted in a victory for the supporters of the municipal light department.

"Following the discharge of Ross, the Municipal Utilities Protective League, which had handled the initiative campaign for the charter amendment, called upon the city council to impeach the mayor, which, after some consideration, it refused to do. Then a movement was started to recall the mayor. In the meantime the mayor supplemented his original statement of the reasons for Ross' dismissal by a letter to the council, listing seventeen charges against him. Some of these charges went back as far as twenty years in the history of the department. Shortly afterwards Ross replied to the charges, answering them one by one, and asserting that none was true. He pointed out also that many of the purchases, contracts, or other acts involved in the charges were either the acts of the Board of Public Works or the mayor and council.

MAYOR'S RECALL UNDER WAY

"The appointment of a new head of the City Light Department by the mayor had to be approved by the council, which for a month or more refused to confirm the candidates nominated by the mayor and adopted a resolution to the effect that it would not confirm any appointment other than that of Ross. Each new appointment and refusal by the council to confirm, as well as other developments, afforded publicity for the recall movement, now well under way. Recently an appointment was confirmed by the council. The opponents of the mayor charged that he had attempted to wreck the City Light Department and that the removal of Ross had been dictated by the privately-owned, competing electric company. The major and his friends charged that Ross was wrecking the City Light Department and it was necessary to remove him to protect the city from the political machine which he had built up.

"Many old charges of mismanagement of the City Light Department were aired, dealing principally with delays in construction and costs exceeding the original estimates. The original estimate by Ross for the first unit of the Skagit hydro development, the Gorge plant, was $4,988,000. This was made in 1918. When the plant was completed in 1924 the cost amounted to $12,787,866.04. This difference between the original estimate and the actual cost has been the cause of much comment, which has continued from year to year. It has been cited as proof of the excessive cost of municipal ownership and of mismanagement. The facts are that the higher cost was due to an enlargement of the plans, the building of a larger tunnel from the dam to the power house, the increase in the capacity of the plant from 53,000 h.p. to 75,000 h.p., and the building of a railroad twenty-three miles long in the place of the wagon road originally planned. The construction was delayed for several years and in the meantime the cost of construction mounted rapidly.

"The Seattle Municipal Utilities Protective League filed a series of charges against the mayor as the basis for the recall. Of these charges, the Corporation Counsel of the city held that two were legally adequate for a recall election, namely, that the mayor had filed a false statement of his reason for the removal of Ross, and second, that he had appointed as superintendent of the Utilities Department (in charge of the street railway system) a man who was not an expert in transportation, as required by the charter. Recall petitions bearing these charges were printed and distributed to volunteer workers.

"The campaign for a recall election was supported by two local newspapers, each a part of newspaper chains, and bitterly opposed by a third newspaper, not a member of a chain. One of these newspapers began to feature stories of graft and favoritism in the city government. The mayor was criticized for purchasing $11,000 worth of office furniture from a revolving fund, without bids. Other purchases without bids were dug up, and the superintendent of Public Utilities was charged with paying an excessive price for various equipment. Other officials were charged with lending city equipment to private contractors. A relative of a public official brought suit to collect $5,000 promised him for his influence by a contractor to the city, but the court dismissed the case as contrary to public policy.

"Toward the end of April the recall leaders filed their petitions with the city clerk, having several thousand names in excess. At this stage the mayor and a group of eight taxpayers started legal action to prevent the recall from being held. Each step in the legal fight, which at this time (May 27) had not been concluded, afforded a great deal of publicity, particularly in the newspapers opposed to the mayor. At the same time a movement was started to get the signers of the recall petition to withdraw their names, but was unsuccessful. The leaders of the recall issued notices, prominently displayed by the press favoring the recall, warning the signers that they might be intimidated by solicitors asking them to withdraw their names, and urging them to report such at once. The signers were alarmed and in some cases it was reported that they turned the hose upon the anti-recall workers. The anti-recall movement was dropped when it became apparent that there was no chance to secure enough withdrawals to prevent the recall election.

"The recall election has been set for July 14, and unless it is denied by the courts, the City will face a bitter contest. The charges permitted to stand as the basis of the recall will have little or nothing to do with the election. The real issue will be the record of Ross, whether the mayor was influenced by the privately-owned utility, whether a political machine has been built up in the City Light Department, and, in a large measure, public ownership versus private ownership. There will be an acrimonious struggle between various forces in the community; public ownership versus private ownership, though in this particular contest there will be no open fight upon municipal ownership; two newspapers against a third one, all attempting to use the fight to increase their circulation; and the mayor versus J. D. Ross. The mayor will suffer because the removal was made on the eve of the election, but will gain by reason of his undisputed legal power to make the removal."

The final outcome of this affair was a vindication, July 13, 1931, for J. D. Ross. William Chester Morse, City Engineer from February 1, 1927 to June 25, 1928, served as Superintendent of City Light during the interim from March 9, 1931 to July 13, 1931 when J. D. Ross was reappointed by the new Mayor.

The recall movement against Mayor Edwards succeeded, as did the Charter amendment to transfer to City Light all the engineering functions pertaining to it that had formerly been the responsibility of the Engineering Department. The Engineering Department completed all contracts on the unfinished work and all required materials were stored in preparation for construction of the power house, the change-over being completed in 1932. In accordance with the Charter amendment, the Lighting Department took over revision of final design, plans and construction of the remaining plant which, when completed, extended the storage reservoir into Canada for about one and one-half miles. Ross Lake, as it has been named in honor of J. D. Ross[4] who carried his dream of cheap power to completion, is larger in area than Lake Washington. Skagit River water, which flows through the lakes and dams of this project is used three times to compound its electric contribution to the City's power, and has become a significant part of the State's power grid system, which in turn is integrated with the Bonneville Power Administration grid.

The dream of the City Engineers who believed that water power should work for people, was realized by a successor who believed further that a beautiful development could surround an efficient plant, and who, to that end, added his botanical skill to his electrical ability.

THE SKAGIT RIVER RAILWAY

Because of its uniqueness, the railway story is told with the following extensive quotations from The Pantograph, Volume III, No. 10, December, 1964. Copy is in the Seattle Municipal Reference Library.

East of Newhalem, the Skagit River Valley closes down into a narrow canyon flanked by mountains which thrust abruptly up from the valley floor. The Skagit River Railway had, at the beginning, only one reason for existing: to serve as a line of supply for the series of vast hydro-electric projects planned by Seattle City Light. The Gorge Power Plant, built at the lower end of the canyon between 1921 and 1924, came first; then, the 389 foot Diablo Dam, seven miles further up the canyon, was built between 1927 and 1930; and finally, five miles further yet, the monumental J. D. Ross project* which required twelve years to build, and which created the 24-mile reservoir known as Ross Lake, was completed in 1949.

At the time that the first of these projects was initiated, the Skagit River Valley was a wilderness in the truest sense of the word: an almost uninhabited tract of mountains and virgin forests, accessible only by pack trail. The terminus of the Great Northern Railway at Rockport was 23 miles from the site of the proposed Gorge Power House; and a means of transporting large quantities of machinery and building material was an immediate necessity. Work was accordingly begun in 1919 on a railroad to connect Rockport with Newhalem, a City Light construction town nestling on the shores of the Skagit River directly across the stream from the site of the proposed Gorge Power House. The work was completed in 1920, and the new track was immediately put to use hauling supplies to build the hydroelectric station, the first of the three that were ultimately to be constructed under the Federal permit granted in 1918 to J. D. Ross, Superintendent of City Light.

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[4] It was originally named Ruby Lake.

* Originally named Ruby Dam

This stretch of railroad was scenic, though by no means spectacular. One per cent was the maximum grade on this portion of the line.

The mile and a half extension from Newhalem to Gorge Creek, site of the dam which provided head for the Gorge Power plant, was something else again. The line twisted and turned its way up the canyon, repeatedly crossing and recrossing the river; while roadbed blasted out of the solid rock of sheer cliffs extended in unbroken stretches of hundreds of feet, and grades reached a maximum of four per cent. In 1927, the road was extended seven more miles to Diablo.

Completion of Diablo Dam and Power House in 1930 interposed what seemed an impenetrable barrier to further extension of the railroad in the form of a concrete massif 380 feet high blocking the entire canyon. An inclined, cable-powered tramway* providing a vertical lift of 313 feet at 68 per cent of grade was therefore built up the side of the canyon to carry the trains up the mountain to the level of Diablo Lake, where a small electric locomotive took over, hauling the cars about a quarter of a mile to the shore. There they were pushed onto a tugboat-powered barge which carried them two at a time, across the shimmering turquoise surface which mirrored the dense forests, the pale blue glaciers, the snow and mist-shrouded peaks which surround it. At the face of Ross Dam, four and a half miles away, the railroad took over again. There, after some skillful maneuvering to line up the rails on the barge with those on shore, a cable powered by a small winch towed the cars up a steep incline to the Ross Dam yards. Finally, a small diesel locomotive took over and pulled the cars on the last leg of their journey to the power house.

Initially built as a strictly utilitarian proposition, the Skagit River Railway quickly became a tourist attraction of nation-wide renown. In 1928, City Light inaugurated its famous summer tours of the Skagit Country; and patronage continued unabated year after year, even through the depths of the Great Depression, a calamity which the railroad scarcely felt.

The tourist trade, even during the lean years of the early 1930s, often amounted to 1,800 fares per week. A round trip, covering 62 miles and including, in addition to glimpses of some of the most spectacular scenery in the world, three square meals in Gorge Inn and overnight hotel accommodations, cost only $2.50.

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* A 43-ton counterbalance offset the weight of the platform, which weighed 50 tons empty. The system, powered by a 400 horsepower electric motor, had a capacity of 143,000 pounds.

On April 4, 1954, the last train, hauling an entourage of secondary school teachers, made its run over the rails from Rockport to Diablo; the next day, the Walter A. Smith Construction Company of Kansas City, began the task of dismantling this railroad. A temporary automobile road was built on the old right of way until a permanent highway at a higher level was completed. All the rolling stock was sold, with the exception of No. 6, which was set up on track embedded in a concrete block at Newhalem and put on permanent display as a momento of railroading days in the Skagit Valley. The inclined railway was kept, as was the barge operation; but all material to and from Ross Dam now moves on rubber tires instead of flanged steel wheels.

CHAPTER 9

Street Lighting

On August 11, 1869 one Charles E. Burrows, a native of Salem, Oregon, arrived in Seattle with the intention of founding an illuminating gas company, and with $13,000 of capital to back his scheme and to encourage local capitalists to risk part of their fortunes with his. The aid he sought was quick in materializing, Daniel Bagley and Corliss P. Stone being only two among the large group of local entrepreneurs who were willing to back their faith in this venture with cold cash. A coal gas plant was accordingly built on the site of what is now the Seattle Union Depot; and on June 6, 1873, a street lighting franchise was obtained from the city. Burners were installed on all the town's major thoroughfares, such as they were in those days; and on the evening of December 31 the flickering yellowish gleam of gas light pierced the gloom of a winter's evening in Seattle for the first time. The new light was an instant success; profits rolled in; plant and service were vastly extended and improved in 1882 and 1883; and by the middle of the decade gas light had become as indubitable a cachet of status in the posher residences of Seattle as it had been in New York and other eastern metropoli some forty years before.

The Seattle Gas Co. retained a virtual monopoly of public illumination in Seattle until late in 1885 when electric lighting somewhat belatedly arrived on the scene. Several factors accounted for the delay: one was the over-cautious and conservative policy of the Edison Electric Light Co., the corporation which had been established to back Edison's original researches and to exploit his invention once it had been perfected; its policies had for several years prevented the widespread adoption of incandescent lighting from central stations. Even more important, perhaps, was the fact that a larger and more receptive population and shorter distances naturally favored the eastern half of the country as the most fertile field for the introduction of the new systems of arc and incandescent electric lighting; but whether for these or for other reasons, not a single incandescent central station existed west of the Missouri River at the beginning of 1885.

San Francisco had a Brush arc light system, and a few sawmills in the Pacific Northwest, notably the mills at Port Blakely and Port Madison, had isolated arc light plants, but although a franchise had been granted to one C. S. Roe for electric lighting purposes as early as 1883, central station electrical service in the Northwest was still non-existent.[1]

To remedy this deficiency a group of Seattle businessmen, including George D. Hill and J. M. Frink founded the Seattle Electric Light Co. at a meeting held October 19, 1885. Its object was to introduce the Edison lighting system to Seattle. Capital stock to the amount of $50,000 was issued, but the company's working capital was exactly zero. The Seattle First National Bank assumed the position of treasurer of the newly established firm, and provided the credit for the plant and everything else that was necessary to start the business. On November 27, 1885, an order for electrical equipment was placed with the Edison Machine Works; and on February 7, 1886, work was begun on the company's first plant. This was housed in a little shed on Jackson St. between First Ave. S. and Occidental Avenue and was valued at $3,500.

On August 23, 1886, the City Council authorized a contract with the Seattle Electric Light Co. to light the streets of Seattle with incandescent lamps, commencing September 1, 1886, and on October 1 of the same year the first bill for this service, amounting to $135.60, was ordered paid. Prior to that, on November 28, 1885, the Council had passed an ordinance authorizing a 25-year franchise which permitted the Seattle Electric Light Co. to use the City's streets and alleys for poles and wires.

Meanwhile the Seattle Gas Co., which up to now had enjoyed a complete monopoly of the lighting business in Seattle, was becoming alarmed at the inroads that the upstart electrical concern was making in its business. And so in June 1886, it took steps to counteract it by reorganizing as the Seattle Gas and Electric Light Co. and by obtaining a 25-year street and alley franchise from the City Council for its distribution system. These preliminaries being out of the way, the new company set to work immediately on its own plant at Fourth Ave. So. and Main Street; and through its efforts the carbon arc light was first brought to Seattle. Far better suited to the lighting of streets and large open spaces than the comparatively inefficient carbon filament incandescent lamps of the day, the arc lamp was an instant success in Seattle, and so was the new enterprise which promoted it.

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[1] This and the following eight paragraphs are adapted from (Blanchard) "Street Railway Era in Seattle," pp. 58ff, where the early development of the electric light and power industry in Seattle is discussed as a necessary preliminary to the purchase and consolidation of all these facilities by Stone & Webster as part of their consolidation of Seattle's street railways in 1900.

Electric light, both arc and incandescent, "caught on" in Seattle from the very beginning. Customers came so thick and fast that by 1889 the Seattle Electric Light Co. found its generating and distributing facilities taxed to capacity, and it accordingly built another and larger plant in a basement at the corner of Post and Seneca Streets, equipping it with two 250-light Edison incandescent dynamos and a 50-light Thomson-Houston machine. Its location next to the plant of the Seattle Ice Co. was, according to Bagley, a highly fortunate circumstance, since the company found itself constantly in need of ice to cool the bearings of the primitive dynamos. The fire of 1889 wiped out the plant, but the electric light had by this time so firmly established itself in Seattle that five weeks later a new plant had been built at the corner of 8th Ave. S. and Charles Street, and was supplying current.

The spring of 1890, when the great rebuilding of the business district of Seattle took place, witnessed so great an increase in the demand for the electric company's service that there was need of a new company to handle the additional business. Dr. E. C. Kilbourne, never one to let such an opportunity slip through his finngers, sold out his interest in the Seattle Electric Railway and Power Co. to L. H. Griffith and proceeded to devote all his energies to the electrical business. He organized the Pacific Electric Co. (no relation whatever to the famous Southern California street railway and interuban system) , obtained a franchise, got a lease for the old power house of the Seattle Electric Railway and Power Company, and added a 35-kilowatt dynamo to the original equipment. Within a couple of months he was distributing light and power to Seattle.

Dr. Kilbourne's plant, like all the early companies, charged flat rates, figured on the basis of the product of the number of lamps into the number of hours they were used each day. Although the Edison chemical meter had been commercially introduced long before, and had been giving satisfactory results to central station systems in the east, its advantages were apparently not appreciated in Seattle until many years after electric lighting had come into vogue. The rate schedule was $1.50 a month for one 16 c.p. lamp burning from a little before dusk until 10:30 P.M., 50¢ per lamp for additional service until midnight and $3.00 per lamp for use all night. Daytime service cost $4.00 per lamp per month.

During the summer of 1890, the Seattle Electric Light Co. was reorganized by the Seattle General Electric Co. J. M. Frink, the founding president, continued in his position, but several eastern businessmen, including former Northern Pacific president Henry Villard, secured interests in it. This influx of eastern capital was a foretoken of things to come.

The Pacific Electric Co. was reorganized as the Home Electric Co. in 1891. On October 1 of the following year this company was consolidated with the Seattle General Electric Co. to form the Union Electric Co. This remained the primary electrical generating and distributing concern in Seattle until 1899, when the Stone and Webster interests took it over as the first step toward the establishment of an almost complete transportation and electric utility monopoly in Seattle. Through the instrumentality of W. J. Grambs, the Maine corporation got its first financial foothold in Seattle. Grambs, acting as agent for Stone and Webster, bought up a controlling interest in the Union Electric Co. before anyone was aware that the firm intended to enter Seattle.

A number of small independent electric lighting firms started in Seattle between 1890 and 1899 were taken over by the Stone and Webster interests at this time. These included the lighting plant of the Rainier Power and Railway Company, where Bagley obtained his first electric light service, paying an average rate of $7.50 a month for less than a third of the candlepower service he was getting in 1929 for a monthly average of $3.00. This confined its services to the vicinity of Pike Street, where the company's car barns and power house were located, and became a part of the Union Electric Company in 1895. There were also the small lighting plant in the basement of the Burke Building, which remained in business on an independent basis until the Seattle Electric Company acquired it in 1900; a plant in the Squire Building at First Ave. near Main Street which provided both steam heat and electric light; a plant in the Arcade Building built and operated by one James Monroe, who provided a few of his neighbors with current and who remained in business for himself until his property became a part of the Seattle Electric Co. monopoly in 1903; and a small plant built by the indefatigable Fred Sander at Taylor's Mill, this being later moved to downtown Seattle and still later to Georgetown after the founding of the Grant Street Electric Ry. finally ending up as part of the Union Electric Co.

By the end of 1891, according to the Report of the Seattle City Engineer's Office for that year, the city was using a total of 89 arc lights (of unspecified make and candle power),[2] 282 30 c.p. incandescent lights and 303 15 c.p. lights to illuminate its streets, and 75 15 c.p. incandescent lights in the engine house, together with an unspecified number at City Hall and at Police Headquarters, the total cost of operating them amounting to $2,733.70 for the month of December. 165 iron lamp posts with goosenecks, lamps and brackets, complete, were specified in the Department's inventory for the same year, their total value at $22 each, adding up to some $3,630.[3]

Street lighting in Seattle continued to be a more or less haphazard affair during the next two decades, electric arc and incandescent fixtures gradually replacing gas luminaries in a piecemeal fashion; the downtown area was lit mostly by arc lamps suspended on cables over intersections or from outriggers on the utility poles with which the city was thickly festooned in those days. Arc lighting had been the favored mode of illuminating streets and large open spaces during the late 1890s and 1900s, the introduction of the enclosed arc in 1893 having greatly reduced the cost of replacing carbons (which in the open arc lamp had to be changed daily), as well as the labor involved in trimming. In suburban areas, where a somewhat dimmer illumination was considered acceptable, incandescent fixtures of varying designs were used; no attempt was made to establish any kind of conformity in design or performance of street lighting fixtures in various parts of the city.

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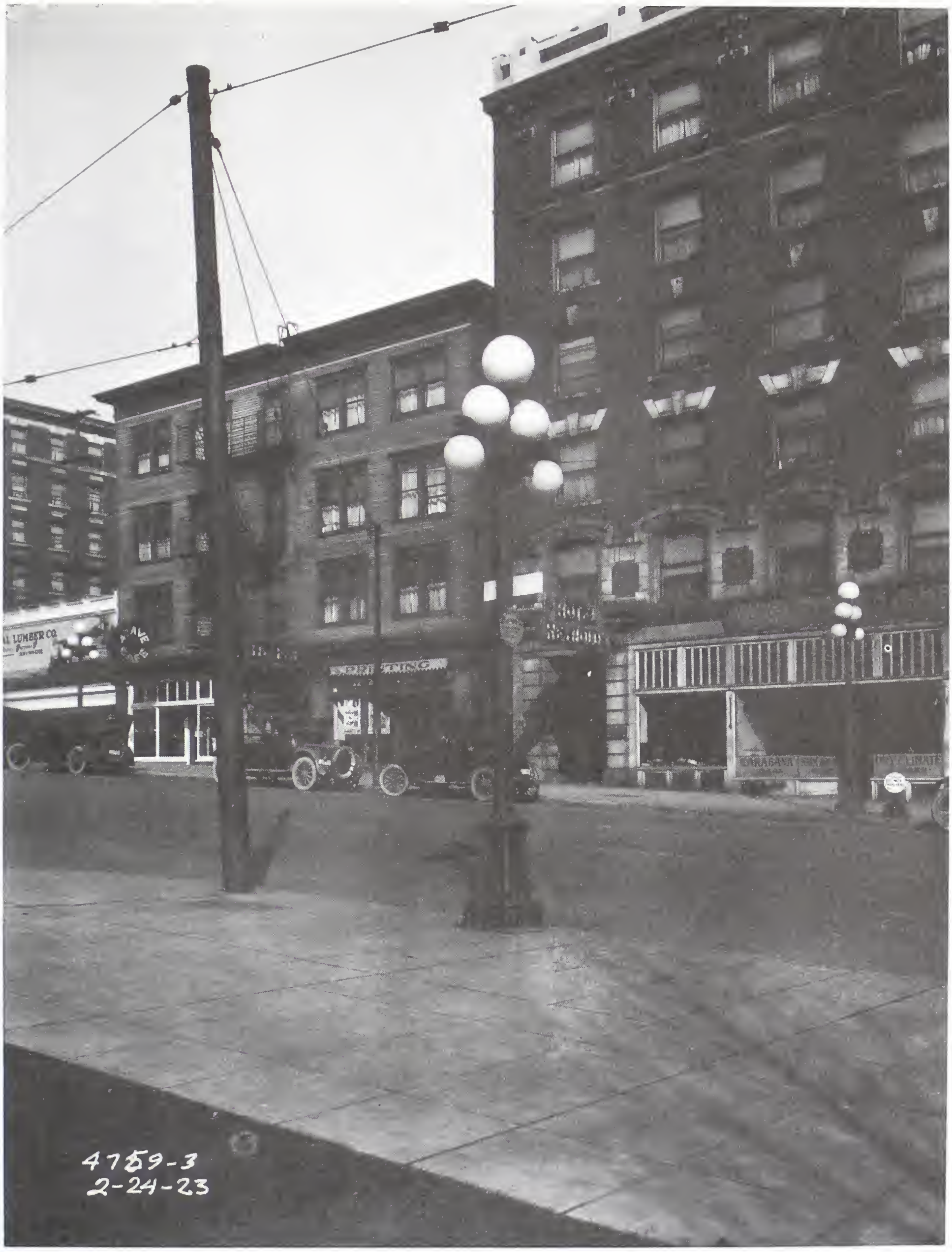
[2] The Thomson-Houston system was used. See next footnote.

[3] City of Seattle Annual Report 1891, pp. 76 and 115.

With the great regrading projects and the virtual rebuilding of the downtown area during the first decade of the 20th Century, Seattle rapidly lost the last vestiges of its earlier village and small town character and began to assume some of the aspects of a metropolis. The haphazard street lighting system which still prevailed there came more and more to be seen as anachronistic and out of harmony with the evolving big city character of Seattle; and it was finally replaced in 1909 and 1910 by the City's first ornamental street lighting system. Instigated by downtown businessmen who successfully petitioned for the improvement on the basis of a Local Improvement District, and designed by J. D. Ross, the new arrangement utilized 80 candlepower tungsten lamps in five-ball clusters on ornamental iron poles, thus producing individual luminaries of 400 cp. each, an intensity considered more than ample for street lighting in those days. Of the total cost of $51,279.07, $31,769.26 was raised by the L.I.D., the balance of $10,194.34 being paid for out of the Lighting Fund. The installation was thus described in the Lighting Department's report for 1911:

"Seattle's cluster lighting system is one of the finest in existence and is generally admired by tourists and visitors from all parts of the country. The main business avenues are lighted by five-lamp poles, placed opposite each other at the curb line and spaced at eighty and ninety feet. The usual design of a five-lamp pole places four globes in the form of a cross, with one center top globe. The Seattle poles, however, have the lamps placed in a triangle perpendicular to the sidewalk, with a 16-inch globe at the top, two 14-inch below, and two 12-inch globes, turned downward, at the base of the triangle. All the globes have a light sand-blast finish. This design gives a beautiful effect of festoons of decorative lights along the sidewalks, and at the same time secures a uniform illumination on all parts of the street. The intensity on the sidewalk varies from 0.32 to 0.79 foot-candles, at the center of the street from 0.34 to 0.45 foot-candles. This illumination, which is ample, is produced by using 50-watt tungsten lamps fed from a small transformer in



4th Avenue, south of Jefferson Street 5-Cluster Lighting—Typical—February 24, 1923

the pole base at a pressure of 8 volts. This type of lamp was designed by the General Electric Company especially for the Lighting Department, and has proved so satisfactory that it has since been made standard by that company. The average life of this lamp has proved to be over 2000 hours.

"In residence districts, where lower illumination is sufficient, three-globe poles are used, similar to the five-globe poles with the two lower globes omitted. In the parks and along the driveways a single 20-inch globe with a 75-watt 12-½-volt lamp is used. Altogether there are 1116 five-ball poles lighting 13.5 miles of street, 378 three-ball poles lighting 8.5 miles, and 137 one-ball poles lighting 3 miles of street, making a total of 1631 poles lighting 25 miles of street.

"In the business district the system is fed from underground mains placed near the curb line. The main feeders are placed in vitrified clay duct with the commercial feeders, and the branches are run in fiber conduit cased with concrete. An exception to this is made when the ducts run under the walk where a basement is to be excavated. In these places steel conduit is used, placed just beneath the sidewalk. Manholes for transformers are placed below the sidewalk at street corners, about three blocks apart. Five, ten and fifteen kilowatt transformers are connected to feed both ways from the manhole, the lamps in each section of street being fed from one secondary coil of each adjacent transformer. A three-wire lead-covered secondary cable is used, so connected that the blowing of a fuse will leave each alternate pole dark, and so leave the street still fairly well lighted. The secondary voltage is 120–240 stepped down to 8 volts by the pole base transformers.

"The cluster lights in the business section are controlled from the sub-station. The cluster light poles were designed by the Department, and made in Seattle."

The idea of using low voltage lamps and transformers originated with the Seattle lighting system, the first low voltage transformers used in street poles being designed and built in the City Light shops while the first low voltage tungsten lamps used for them were made by the General Electric Company by request of the Department. This system gave over 2000 hours life to the lamps and the system has been rapidly adopted all over America.[4]

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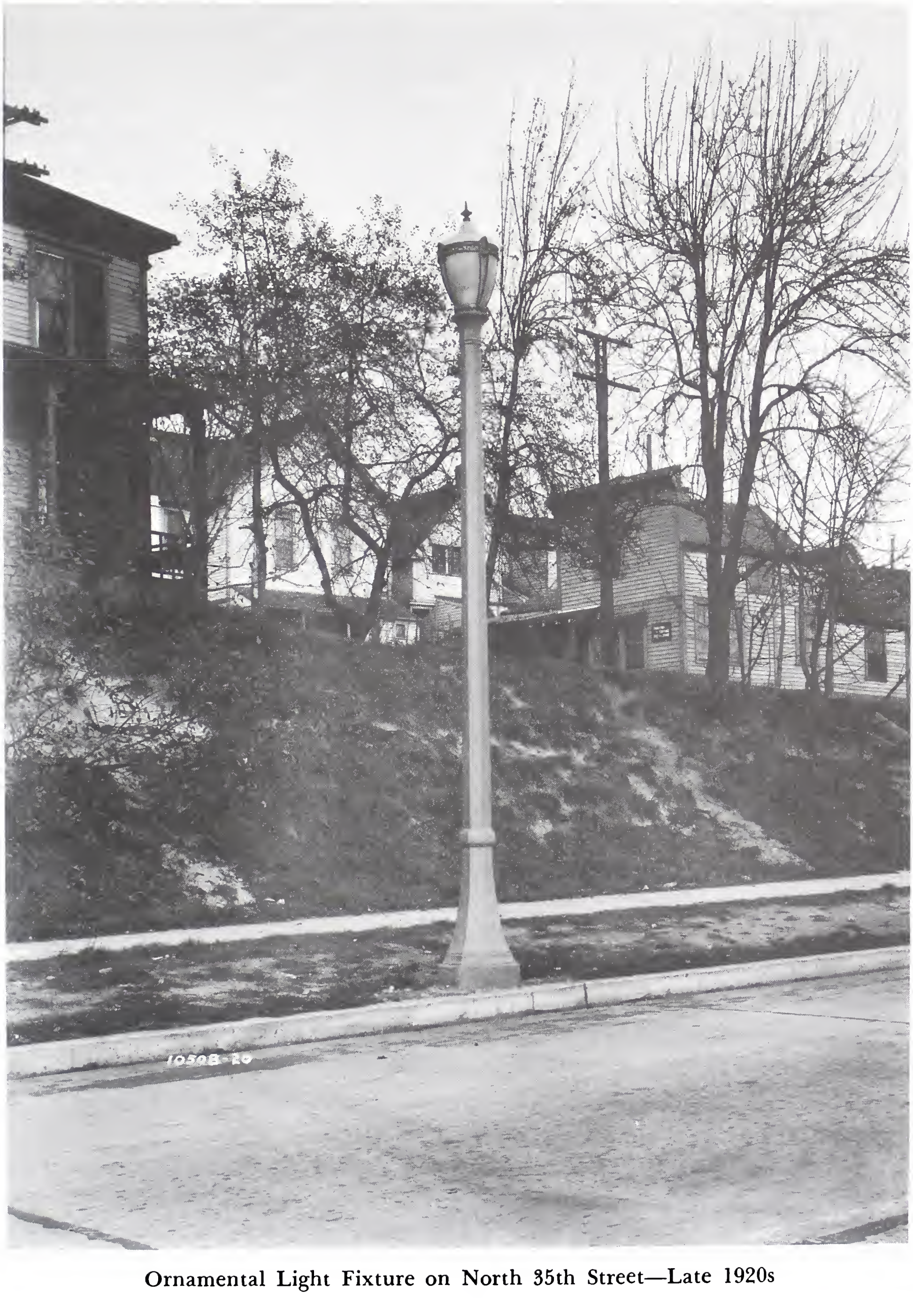
[4] pp. 61–65. With regard to the lighting of the rest of the City, the report had this to say: "The series street lighting system comprises 683 miles of No. 6 wire divided into 29 circuits, lighting 601 miles of streets. The circuits are connected two in series to 6.6 amperes 100 light air-cooled G.E. constant-current transformers. Each of these is equipped on the primary side with a small solenoid-operated oil switch made by the Department, and with a test board with plug switches. This arrangement keeps all pressures above 125 volts away from the switch-board. The voltage on the circuits varies with the number and kind of lamps from 2500 volts to 5000 volts. In all, there are 692 6.6 ampere arc lamps, 5315 40-c.p. tungsten lamps, and 199 300-c.p. tungsten lamps. The large tungsten lamps were manufactured especially for the Department. They have proved satisfactory in every respect, giving steadier, better-distributed light and averaging over 2000 hours of life. The 40-c.p. tungstens are mounted by "goosenecks" on the line poles. This type of lamp is ideal for its purpose since it gives light in small units at a minimum cost for maintenance and power.

The test of the series lighting circuits shows an all-day efficiency for 1911 of 86.3 per cent from the switch-board to the lamp. The loss in the transformers was 5.0 per cent, and in the line, 8.7 per cent.



Ornamental Light Fixture on North 35th Street—Late 1920s

The system thus described was utilized throughout the downtown area, except in the area owned by the Metropolitan Building Co., on the old University of Washington site, the streets of which had never been dedicated to public use; here the University Administration, which controlled the property made its own provisions for lighting the streets. Westlake Avenue and the other major thoroughfares leading into the city were also lighted with the cluster lights; and, as the extract quoted above indicates, these lights were a source of undisguised civic pride for many years.

By the middle 1920s, however, they were becoming obsolescent, both in appearance and in illuminating power; with the coming of heavy motor vehicle traffic street lighting standards had risen sharply, and the old 400 c.p. luminaires were no longer considered adequate. As early as 1925 a more modish system of single high intensity electroliers had been installed on 4th Avenue from Virginia Street to Cedar Street; and as the following extract from the City Engineer's Report for 1925 indicates, the street lighting problem was once again becoming a paramount concern:

STREET LIGHTING

"This is one of the most perplexing problems with which we have to deal. Those of us whose experience extends into the past some thirty years or more can recall the curb and sidewalk controversies, when each individual wanted his own kind of sidewalk and a curb grade to fit his property, regardless of the effect on the street as a whole. The street lighting problem is a repetition of those controversies, only it seems more acute.

"Inasmuch as the lighting problem is approached from two standpoints, viz: decorative effect with comparatively poor street illumination from the standpoint of safety to vehicular traffic, and vice-versa, we have the basis for a violent disagreement in the very beginning. The property owner paying for the installation of the lights in what he considers his own parking strip, feels an ownership in them hard to be shaken, and is usually very insistent upon what he wants, while the City is interested most in rendering the streets safe for the greatest traffic, and attaining that result at a minimum of cost.

"In 1922 we started systematically to work to solve the lighting problem. We measured the intensity of light actually cast upon the street,—and that served a useful purpose,—in Aberdeen, Olympia, Tacoma and Seattle. We would select a block and lay it out in 20-foot squares and measure the light at each corner. We found that in most cases the intensity of light in the street varied between wide limits. Around the standard it would be very intense and midway between the standards there would be practically no light.

"The companies furnishing lamps and glassware for street lighting have developed what is called the Asymmetric or Bi-Lux refractor. This refractor throws the light to the street side of the curb and covers nearly a rectangular area of the street. With this type of refractor it is possible to get a comparatively uniform distribution of light, and one that is quite satisfactory, from the standpoint of the vehicle, but is unsatisfactory to the property owner, interested in the decorative effect.

"In the matter of standards, we obtained catalogues from most of the makers, but soon found that we would have to have something less costly than the average metal standard on the market. We found that a serviceable standard could be made of concrete and we have had several designs for the use of this material made and submitted to a committee of architects for the determination of their architectural merit.[5]

"The cost of street lighting ranges from $2.75 per foot for the type of light on 5th Avenue North, to $4.50 for the 5th Avenue, et al. The annual charge for current and maintenance will range from 40¢ per street foot to $1.20 per foot. This latter burden is borne by taxation and should we have from 500 to 700 miles of lights to care for, the annual cost would run from $1,000,000 to $3,000,000. It is, therefore, a matter of some moment that we get the most economical types and system possible. A million dollars annually, capitalized at 8%, would represent an expenditure of $12,500,000 and $3,000,000 an expenditure of $37,500,000.

"We now have a total of 32 miles of the standard type of lighting, six miles of which were constructed in the year 1925. In addition, there are many miles of the street intersection light, and judging from present indication it is believed that there will be an ever-increasing demand until street lights and street paving will go hand in hand."

The need for a new and brighter system being universally acknowledged by 1925, the next problem was to design one the performance and esthetics of which would satisfy the greatest number of downtown Seattleites. This (as the above quoted passage indicates) proved to be no easy task, since it soon became evident that every downtown businessman or civic official had his own pet design for a new decorative street lighting system; some even went so far as to have a specimen or two of their favorite luminaire installed on their premises at their own expense, each assuming, apparently, that once the city officials had actually seen his pet design, they would immediately accept the new design and take steps to get it installed throughout the city. But the issue could not be delayed indefinitely while advocates of this or that design engaged in endless squabbling; by 1927, most of the downtown merchants and businessmen had already petitioned for a new lighting system to be financed through a Local Improvement District. Late that year, Carl Gould, of the architectural design firm of Bebb and Gould, submitted preliminary plans for the design of a new ornamental system. These were refined and put into final shape by Arthur G. Tralle, at that time head of the L.I.D. Design Section of the Engineering Department, who also designed the electrical supply system.

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[5] The above-mentioned 4th Avenue project had utilized concrete standards, as had a similar installation on 6th Avenue.

Contracts were let early in 1929, and the work was reported complete on January 24, 1929. The project, which was subsumed under L.I.D. No. 4642, encompassed all of Third and Fourth Avenues from Jackson Street to Virginia Street, and all cross streets between Second and Fifth Avenues, except for those within the University Tract—where, once again the Metropolitan Bldg. Corp. assumed the responsibility for the design and installation of a new lighting system[6]—and out Westlake Avenue as far north as Valley Street. Two-light standards were installed on all streets except Union, Pike and Pine, where three-light standards were used.

The relighting of 1st and 2nd Avenues was accomplished under L.I.D. No. 4641, plans for which were approved January 8, 1927. As in the Third Avenue et al lighting system, a three-wire multiple distribution system was employed to minimize voltage drop; primary circuit voltage was 5000, secondary voltage was 600 and 125 was the voltage at the lamps themselves. 500 watt Mazda "C" (gas filled) lamps, of approximately 1000 candlepower each, were specified; opalescent and alabaster rippled glassware was used for the enclosing globes. Three-light standards were installed on Second Avenue South north of Jackson Street and on Union, Pike and Pine Streets; two-lamp standards were called for on the others; all of them were furnished with cast bronze brackets. The modernization of Seattle's downtown lighting system was virtually completed by the beginning of 1929, at which time all the old cluster lights had been removed.

Residential areas came in for their share of street lighting attention shortly after the relighting of downtown. By the end of December 1931, the City had completed the replacement of the old series incandescent overhead lighting system with a multiple system operating on standard 110-volt residential distribution circuits. Although somewhat more economical, the old series incandescent system, like the even older series arc lighting system, had been a source of constant and serious danger; potential differences between wires and ground was as high as 8000 or 10,000 volts in some places and many serious accidents had been caused by the wires being blown down by storms. Conversion to 110-volt multiple circuits, in addition to eliminating the danger of high line voltages, eliminated the need for specially designed meters, circuit breakers and switch-gear; and this saving

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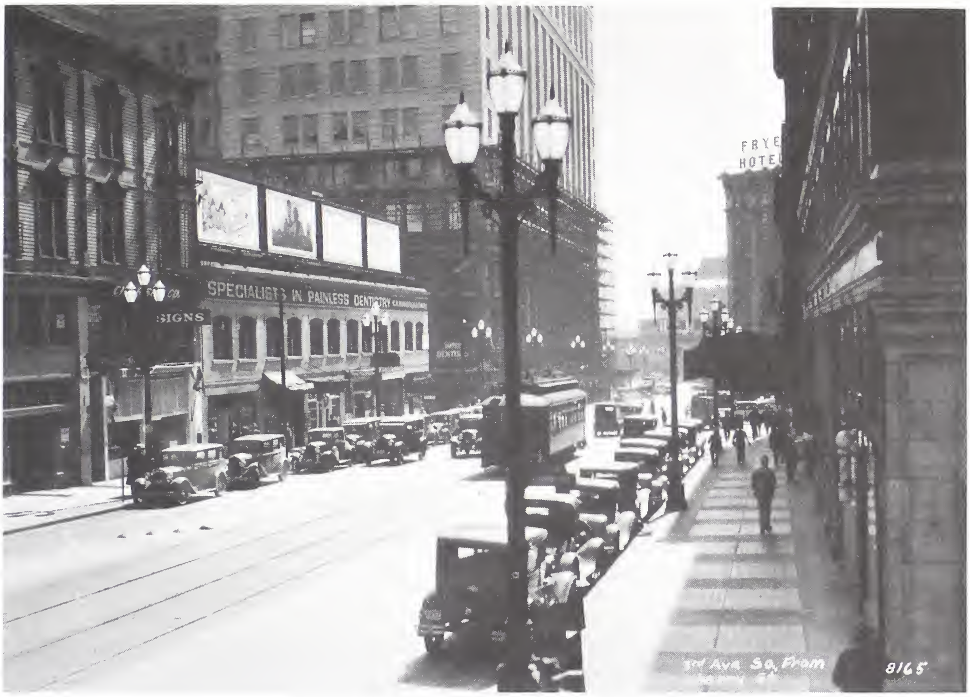
[6] In this area, which included 5th Avenue between Seneca and Pike Streets, 2 light standards with 2000 c.p. incandescent bulbs and 66-foot spacing were used; power was purchased from Puget Sound Power and Light.



Third Ave. S. from Cherry Street, showing the new three-lamp standards and the recently reconstructed County-City Building, where work is nearing completion on the additional stories. Date: April 11, 1930, Third Avenue, along with most of the other downtown thoroughfares, had just recently been repaved with concrete, accounting for the unusually neat and clean appearance of the street.

afforded the additional economic advantages that more than offset the greater operating efficiency of the series system.

In 1936, on the basis of a recommendation in a WPA traffic survey, safety silhouette lighting was installed as protection for pedestrians and cross traffic at Eighth Avenue and Boston Street. Two or more fatalities had occurred at each of these locations within the year. A sodium vapor luminaire was installed at Sand Point Way and East 65th St. where there had been three fatalities because of the confusing turn in the roadway.

Safety lighting with the objective of reducing traffic accidents began in 1942 after a request by the Broadway Community club for a survey of primary highway lighting. Conferences between the Engineering Department and the City Light Department resulted in priority being given to areas showing the greatest number of night time accidents and highest traffic volumes. After discussions between the two departments, it was agreed that Old U.S. 99, the Pacific Highway through the City, should be better lighted. The decision was made to light the southern portion first, and 218 luminaires and other required fittings were installed in Fourth Avenue South from Airport Way to East Marginal Way.

Shortly after World Way II, agitation began once again for a modernization and upgrading of Seattle's street lighting system. Residential lighting was still more or less of a haphazard affair, with different styles of luminaire and different degrees of illumination prevailing in different parts of the city; the general level of illumination was considered dangerously low and was believed to be a contributing factor to night time auto accidents and nocturnal skullduggery. By 1946 the need for another thorough modernization of street lighting throughout the City was generally recognized. In January of that year the chief Traffic Engineer, pointing out that the luminaires in the downtown area wasted about 40 per cent of their light upward, advocated their replacement with mercury vapor lamps; in addition he urged that mercury vapor lamps be used to replace the old "gooseneck" and "outrigger" pole-mounted incandescent fixtures that had been doing duty on major arterials inside the city since the early 1920s. Mercury lamps had already been installed on an experimental basis on Fourth Avenue South between Lander and Stacy Streets, on Aurora Avenue at N. 50th St., and elsewhere, and had demonstrated their superiority over

Experimental fluorescent street lighting units on Market Street, in downtown Ballard, March 8, 1952. They were replaced with standard mercury vapor lamps shortly after this picture was taken. The view shows the soon-to-be-replaced incandescent fixtures.

the prevailing incandescent system from the standpoints both of safety and of economy.

The agitation for better lighting culminated in the passage, by the overwhelming majority of 83,738 to 17,492, of a $4,000,000 bond issue in the election of March 1948. This provided the financial resources for a six-year plan which involved all the major arterials and the entire downtown area. The arterial portion of the project was pronounced complete in late autumn of 1954, while the relighting of the downtown area began in 1952 with the 1st Avenue, et al project, continued through 1953 when most of the remainder of downtown was relit, and ended the following year with the replacement of the old concrete post luminaires on 6th Avenue. On most of the downtown streets the old bases were retained and the new standards which were installed upon them conformed more or less to the general esthetic design and proportions of the fixtures which they replaced. The relighting of residential areas was not begun in earnest until August 4, 1964, when a 4-million dollar program involving the replacement of some 24,000 pole-mounted and cable-suspended incandescent fixtures got under way; this program was finally completed some four years later.

Sodium vapor lamps, having been tried and found somewhat wanting during the early 1940s, have come back into favor during the late 1960s; experimental installations of them having been put into service on some of the major entrance thoroughfares of the downtown area such as Jackson Street and Stewart Street. Spectacular advertising effect, rather than illuminating requirements *per se* seem to have been the motive here; the effect of these high intensity light sources has indeed been spectacular, but opinion seems to be divided as to the esthetic and general economic merits of the installation. The first Lake Washington bridge was lighted by sodium vapor lamps during the 1940s, but the early units were complicated and expensive and were eventually replaced by cheaper and more reliable mercury vapor lamps; recent improvements in the design of sodium vapor lamps have made them once again competitive with mercury lamps. The superior fog-penetrating capacity of sodium vapor light is an important consideration in its favor, and one which led to the widespread earlier adoption of this form of illuminant, in spite of the disadvantages previously mentioned.

CHAPTER 10

Public Utilities

A Charter amendment in 1908 created the Department of Public Utilities and its Superintendent became the fifth member of the Board of Public Works. He had an assistant superintendent, and the necessary engineering, inspection and office personnel to carry out all assignments.

The Department of Public Utilities was required to enforce all the franchise obligations of the public utility companies which operated within the City. It issued permits for the work and kept an accurate and complete record of all such work in the city streets. The public utility companies in 1908 consisted of two telephone companies; The Seattle Electric Co.[1]; the Gas Company; Western Union Telegraph; Postal Telegraph; a steam heat company and five railroads, i.e., Northern Pacific, Great Northern, Oregon-Washington (Union Pacific), Columbia and Puget Sound (later Pacific Coast), and Chicago, Milwaukee and St. Paul.

Three years after its creation the Public Utilities Department found itself in the street railway business. To understand how this came about a brief digression will be necessary.

Street car service in Seattle began on September 23, 1884, when the Seattle Street Railway Co., organized and built by Frank Osgood and financed by both local and Boston capital, began operating horse cars on Second Avenue between the old Occidental Hotel and Pike Street, and thence out to "Queen Anne Town" at the foot of Queen Anne Hill. This service was further extended by early 1886 out what is now Westlake Avenue to Lake Union, where a wharf and a recreational park had been

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[1] In 1912, this was reorganized as Puget Sound Traction, Light and Power Co.

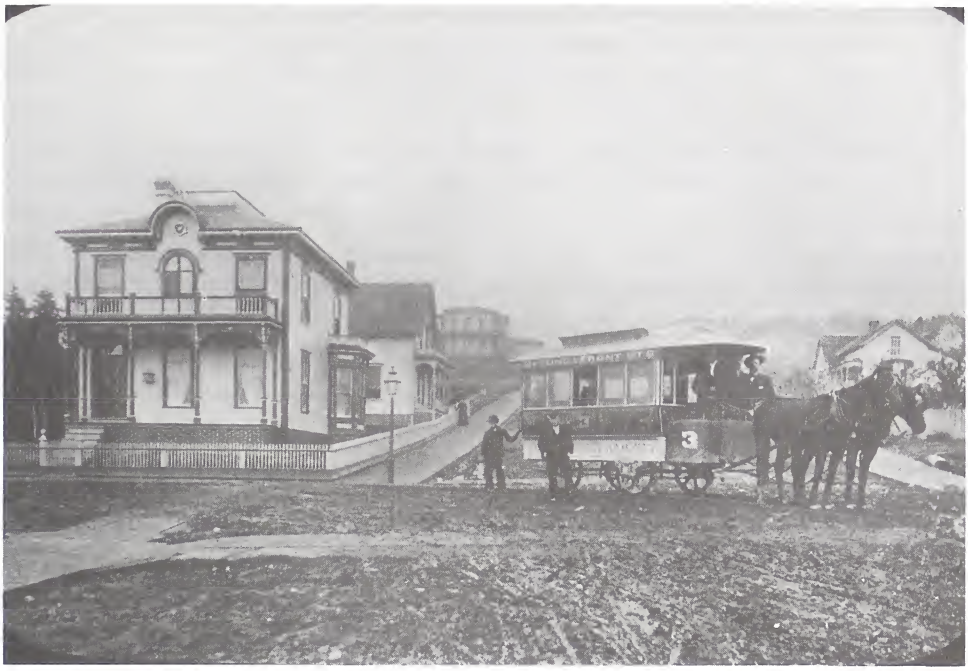

Photo courtesy of Seattle Historical Society

East on Pike Street at 2d Avenue, Seavey home, 50th in Seattle—ca. 1886–1889

built. The line was the first of its kind in the Northwest, and was a great popular novelty, a much appreciated public service, and an inducement to speculation in real estate; but, withal, a precarious financial venture. A single horse was found to be unable to negotiate Seattle's hills, and it became necessary to employ two horses; this multiplied operating expenses and brought the system's revenue to a dangerously low ebb. A document in the files of the Public Utilities Department relates, in this connection, the following anecdote that dates from 1886:

"An old black horse stood at the foot of James Street[2] waiting to assist the outbound (horse drawn cable) car in negotiating the grade between Front Street (First Avenue) and Second Avenue; he needed no driver and was always on the job. As soon as the car approached, this old horse would walk out to the car and permit himself to be hitched with the others to the car and after performing his part of the work, walked slowly back and took up his position to await the coming of the next car."

The unexpected cost of operating the horse railway induced Osgood to give serious thought to electricity as a motive power, and early in 1886, at the behest of his partners, he took a flying trip back to his native Boston and to other eastern cities to study the progress that had been made in the use of electricity as a motive power for street railways. Finding it still more or less in the experimental stage, Osgood returned with a recommendation to continue the use of horses; and there the matter rested until 1888, when another group of entrepreneurs brought up the matter of electric street railway once again, obtained a franchise, organized a company, and set about to build an electric railway to be called the West Street, Lake Union and Park Transit Company. Hearing of these plans, Osgood closeted himself with L. H. Griffith, F. J. Blunck and other organizers of the new traction venture, and induced them to join forces with him to the extent of electrifying the original horse car line. This was accordingly done and late in March 1889, four wheeled electric bobblers began running up and down Second Avenue under trolley wire. It was the first electric railway on the Pacific Coast and for a year after its inauguration the only one; and it was, during its early years, an extraordinarily successful enterprise, both as a source of profit and as a stimulus to real estate development.

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[2] Pike Street was probably meant here rather than James; the car barn was on the corner of 2nd and Pike, with a steep grade between Pike and Pine where the rails jogged west to Front Street from Second Avenue; there was no appreciable grade on James Street between Front Street and Second Avenue.

Real estate, in fact, bulked larger in the early street railway picture than legitimate transportation needs. The late 1880s and early 1890s, in Seattle as well as elsewhere in the country, were booming and prosperous times; and the street railway was becoming a prime stimulus, if not an absolute prerequisite, in the opening up of new territory for subdivision and settlement. By 1891 no less than thirteen separate cable and electric railways had been organized or were in operation[3]; the 1891 Annual Report of the City of Seattle indicated that 48 miles of electric railway and 22 of cable line were in operation; and, according to the address of Mayor Harry White, this 70 miles of trackage exceeded that of any other city in the United States. A great deal of it was, as previously indicated, speculative; and in most of the territory through which one of the less provident lines was built the only inhabitants were chipmunks and gophers. The depression of 1893 put an abrupt and catastrophic halt to the whole frenzy of real estate speculation and swept into bankruptcy most of the street railway entrepreneurs who had pinned their hopes on the indefinite proliferation of land settlement and subdivision. Receivers took over all but one or two of the companies; bondholders suffered heavy losses; expansion ground to a halt and the overbuilt and overcapitalized lines creaked along as best they could until 1897, when, after four lean years, the Alaskan gold rush began to bring a flush of prosperity back to Seattle.

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[3] Any detailed history of the individual lines and their fortunes (and misfortunes) would be out of place in a history of the Engineering Department; there is a more or less complete account of them, with pictures and a roster, in (Blanchard's) "The Street Railway Era in Seattle." (See Bibliography).

During the above-mentioned year the Eastern utility firm of Stone & Webster became interested in the Seattle Street Railway properties, partly through recognizing that the potentialities of a profitable transportation operation existed in Seattle, and partly also in hope of recovering securities which the company held for equipment originally purchased from the Thomson Houston Company by some of the local street railway companies. With the support of Jacob Furth and other local magnates, Stone and Webster quietly set about buying up traction properties and independent electrical generating plants in Seattle; in 1900 and after successfully defeating the local Populists who feared in equal measure (and with considerable justice, as matters ultimately turned out) the influence of eastern capital and the virtual monopoly which the Stone and Webster interests would acquire by their purchase and consolidation of the street railway properties in Seattle, the eastern firm secured a consolidation franchise from the City and took over the entire existing street railway network, with the exception of the Seattle, Renton and Southern interurban.

The Seattle Electric Co., the firm jointly organized by Stone and Webster and the local capitalists who had assisted the eastern firm in entering Seattle, spent several million dollars during the next eight years in rebuilding and rehabilitating the existing street railway system, purchasing new equipment and building extensions to the north and south ends of the City. Service improved markedly during these years; but as the end of the first decade of the Twentieth Century approached, the operation began to be less profitable to the Stone and Webster interests, which tended more and more, in the years that followed, to neglect its Seattle properties in favor of more profitable installations elsewhere in the country. Service and equipment began to deteriorate, stimulating a resurgence of the municipal ownership advocates who had been defeated but by no means routed in 1900.

The muckraking and reform spirit of the first 15 years of the Century was propitious to the case of the municipal ownership advocates, who steadily gathered strength and popular support. A more immediate and tangible factor on the local scene was the dismal fortune of the Seattle, Renton and Southern Railway, whose history after a 1907 change of management had been an almost unbroken record of ineptitude and mismanagement. Failing to remain solvent or to fulfill its franchise obligation, it furnished the local municipal ownership people with a standing argument for the operation of all the local lines by the City; and the line itself was cited as the ideal place to conduct the crucial experiment which would demonstrate the superiority of public over private management. The political climate being what it was, they had no difficulty persuading the voters to authorize the City's purchase of the line on the basis of an $800,000 bond issue in a special election March 7, 1911. But the residents of Renton wanted no part of this scheme, and so informed the management; the latter promptly responded by raising the purchase price to $1,200,000, whereupon the City Council dropped the original plan and diverted the $800,000 to the building of a line from 3rd and Pine Street to the south end of the old 14th Avenue N.W. trestle, via Dexter Avenue and Nickerson Street. The new line, dubbed Division "A" of the Seattle Municipal Railway, and intended as a showcase of municipal management, was placed under the supervision of the Department of Public Utilities, and the City thus officially got into the street railway business. In 1913 the Highland Park and Lake Burien Railway, a line which originally took off from the intersection of W. Marginal Way and Spokane Street, climbed the side of the hill to White Center and ran thence to Burien and Seahurst, was deeded to the City by its original builders. This, likewise put under the Street Railway Division of the Public Utilities Department, became known as Division "C" of the Municipal Railway, and began operation in May 1914.

This plunge by the City into the street railway business did nothing to improve relations between Seattle and Stone and Webster; and the coming

Interior view of one of the Cincinnati 100–111 series cars of the original Seattle Municipal Railway. Note the luxurious upholstering of the seats. October 1, 1914 of World War I, with the enormous transportation burden it placed on both the Municipal and the Stone and Webster systems as the result of a massive influx of shipyard workers to Seattle, strained relations to the breaking point. Involved in an interminable series of litigations with Stone and Webster about the latter's failure to live up to its franchise obligations, distracted by controversies concerning fares, harried by labor disputes, confronted with the apparently insoluble problem of moving twice as many passengers as the existing system had been designed for, the City was unable to see any other way out of the impasse than that of purchasing and operating the entire Stone and Webster street railway system. The exigencies and hysterias of the period proved to be too much for the municipal authorities rationally to cope with; and in the end, Seattle purchased the Stone and Webster rail properties at what amounted to the company's own price and terms. The date on which the entire system became a part of the Municipal operation, April 1, 1919, was a grimly appropriate one.

The burden of operating the newly acquired system fell upon the Superintendent of Street Railways of the Public Utilities Department; and a burden it turned out to be indeed. Confronted with a rash of collisions, fires and runaways during the first year of operation, and with the impossible problem of operating the system at a profit in the face of the post war business slump in Seattle and the rigorous and inflexible payment terms that had been written into the purchase contract at the behest of Stone and Webster, the Street Railway Division, on balance, performed as well as it could have been expected to under the circumstances and managed, by various dodges, to keep the operation from slipping irretrievably into the red. Having extracted a total of 15 million dollars for an installation which the State Board of Tax Equalization had evaluated in 1918 as worth five and a half million (a figure later confirmed by two other independent sources), having secured a provision in the purchase contract which established a prior claim on the system's revenues and having, in addition manifested every indication of its intention of enforcing this claim to the letter (save for payment moratoriums which it allowed only when the choice was between that and the imminent bankruptcy of the system) the Stone and Webster firm had made its lack of interest in or sympathy with the rail system's plight unequivocally clear.

The State Judiciary added to the railway system's woes by prohibiting any kind of subsidy to it, and stipulating that all its expenses had to be funded exclusively out of its revenues. A temporary loan of $83,000 from the General Fund to the Street Railway Fund in 1920 precipitated a court case that was finally decided two years later by the State Supreme Court: a decision being handed down to the effect that the City could not, by any means, or under any pretext, subsidize the expense of operating the Street

Railway system.[4] So broadly were the terms of this decision interpreted that they effectively prevented any subsidization of public transportation in the State of Washington until special legislation permitting this was enacted by the 1965 State Legislature.

Effectively blocked from solving its financial problems on the one hand by the intransigence of Stone and Webster, and by the Court Decision just mentioned on the other, the rail system was able, by prudent management and stringent economies[5] to struggle along with a reasonable semblance of solvency until the Depression slashed its already slender revenues, augmented its financial and operating difficulties, and made the finding of new financial resources imperative. Blocked from any really effective solution by forces beyond its control, the Street Railway Department and the Municipal Government sought, by various economies and attempted management reorganizations to alleviate its problems as best it could. In 1931 the City Council appointed an advisory committee to explore the problem and to propose remedies; the work of this committee eventually resulted in a three-part proposal to revise the City Charter in such a way as to place the operation of the Municipal Railway under the jurisdiction of a six-man appointive Transportation Commission, with a transportation manager to be appointed by the Commission; included as an afterthought was a corollary proposal to abolish the position of Superintendent of Public Utilities, this office being made largely redundant by the removal of the Street Railway Department from its jurisdiction. At the March 1932 election, the voters rejected the Transportation Commission proposal but adopted the proposal to abolish the Department of Public Utilities. The result was chaos compounded with confusion, the Street Railway Division, the Weights and Measures Division and the Franchise Division of the Department being in effect "orphaned" and left without any centralized supervision or direction until the new Mayor took office. Not until August 1932 was the havoc mitigated; emergency legislation was signed by Mayor Dore on the 18th and 23rd of that month, placing the Franchise divisions of the former Public Utilities Department under the direct supervision of the Board of Public Works, and creating a civil service position of Superintendent of Street Railways, also directly responsible to the Board. Under the new tutelage the street railway system continued to operate until it slid into its long expected bankruptcy in 1938, and the legislation was finally enacted which authorized the creation of a three-man transit commission; and the Reconstruction Finance Corporation Loan was finally authorized that enabled

[4] S. B. Asia et al vs Seattle (See footnote No. 1 Chapter 12.)

[5] No new rail equipment was purchased during the entire 20-year life of the Seattle Municipal Street Railway, the system making do with refurbishing and patching of old equipment, some of it dating from 1899.

the system to be refurbished and completely re-equipped with rubber-tired vehicles.

WEIGHTS AND MEASURES DIVISION OF THE DEPARTMENT OF PUBLIC UTILITIES

The Department of Weights and Measures was created by Ordinance No. 26018, approved December 31, 1910. Section two of the ordinance stipulated that the Superintendent of Public Utilities should be ex-officio Superintendent of Weights and Measures. An inspector was appointed under Civil Service regulations. Duties of the new Department were many and varied as those were the days when the motto was "Let the buyer beware." Many items were short on weight and measure and the enforcement of making the net weight on the packaged goods met with great opposition from the jobbing trade and packers. The Superintendent was required to secure a complete set of accurate weights and measures which had to be tried, proved, sealed and certified by the official custodian of weights and measures for the State of Washington or by the National Bureau of Standards of the United States. These became the standard weights and measures for the City of Seattle and for all its vendors. The first set came from the National Bureau of Standards of the United States, because the State Bureau had not yet been established. Of gold plated brass, it was subject to biennial examination and approval by the State Inspector.

Retailers were urged to return goods which were not marked as to weight or measure until compliance with the requirement was established; this resulted in several law suits and prosecutions. The Public Market required constant supervision during the first year of the operation of the Weights and Measures Department. It then had the unenviable reputation of being Seattle's "Thieves' Market."

The work of Weights and Measures gained in popularity during the next several years; there were fewer complaints about its requirements and its reputation was growing. The State Department of Weights and Measures was established in 1913, and a former City Inspector was appointed as superintendent. The State's stipulation that indication of net contents be required on all packaged goods was upheld by the Supreme Court in April 1913, raisins, salt and pails of lard being specifically involved. The City Inspectors were thus enabled to hold the packer responsible for the weight of the package.* In September 1913, the Federal law concerning weights and measures went into effect. Seattle's department had been operating up to the requirements thereof, and served as an example for other cities.

Weights and Measures had been continuously troubled with inaccurately sized milk bottles. In the one year of 1923 it had confiscated and destroyed 28,920 bottles before they reached the distributors. Had they been used, they would have been responsible for an $11,000 loss to the consumer.

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* One meat-packing company had been including the weight of paper wrappings in its pricing of ham and bacon.

City Inspectors in the Weights and Measures Department were given the status of State Inspectors in 1921. This enabled better checking of peddlers and wood dealers who operated both inside and outside the City limits. Short measure in the sale of wood was a constant source of complaint, especially when it became the custom to sell it by the weight instead of by the cord or rick. Ice was another source of trouble as the wagons had no scales and the weight of individual blocks was a matter of guesswork.

The Department carried out a program of education by means of addresses given before Women's Clubs where attention was called to more useful methods of buying, learning to read the modern computing scales, and other information which would help to identify unscrupulous vendors. Home economics classes visited the Department and the newspapers carried educational items.

The 1925 annual report of the Department stated that aside from the actual necessities of life there was, perhaps, no one thing that received greater consideration from all classes of people than the automobile. It received so much attention and outlay that it had almost attained the status of a necessity. This situation added the checking of 350 service stations and garages to other duties of the Weights and Measures Division. About 56 million gallons of gas were pumped in 1924 and the inspection of meters, pumps and other measuring devices was important to prevent a material loss to consumers resulting from inaccurate measure. The large distributors were generally cooperative in reporting any changes or repairs in equipment.

Early in the century the Oregon and Washington Railroad Co. had begun work on a tunnel under the City which was to follow the approximate route of Fifth Avenue for a portion of its length. It was started at Main Street in November 1907 but never progressed beyond Terrace Street where it stopped in March 1908. Because this operation was carried out under franchise from the City, it fell under the supervision of the Public Utilities Division. It was said that lack of money caused the railroad to give up its tunnel construction, leaving the abandoned excavation as a hazard to further surface construction. At about the same time, construction ordinances had been approved for building the original Public Safety Building at Fifth Avenue and Jefferson Street. Several years after the building was completed City inspectors became concerned that collapse of the wooden structures in the abandoned tunnel might affect the building. A pronounced settling along the area was, in fact, discovered and water and sewer mains were endangered. It was August 1921 before the railroad engineers got around to filling the old tunnel and it was April 1922 before they completed the job. Timbers were removed through a drift tunnel and manholes that had been constructed every 500 or 600 feet in lots abutting the right of way, and a lean concrete mixture was pumped into the tunnel. When the water and sewer mains were repaired and reconstructed, a new street was graded and paved over the old one.

Public Utilities people were concerned with the increasing need for protected grade crossings across the Argo Yard and at the Albro Crossing at Graham Street. The Argo Yard crossing was one of the most dangerous in the City. All the railroads from the south and the Seattle-Tacoma interurban, altogether nine steam and two electric tracks, crossed the yards in Eighth Avenue South within a distance of about 700 feet. Practically all vehicle, horse and pedestrian traffic from the south crossed these tracks at grade. Railway men as well as representatives of the city recognized the need of an overcrossing but no scheme had been evolved to correct or eliminate the danger.

The Bogue Plan of 1911 had proposed the elimination of grade crossings, advocating raised tracks and street subways. Raised tracks were declared to be undesirable and were considered impractical by the railroads. The Public Utilities Department was involved in working out many solutions for these grade-crossing problems. A multiple user arrangement to cut down the number of tracks was among recommendations made by the Department.

Agreement between the railroads and the City on the Argo Yard grade separations was reached in 1927 and construction began under the franchise provisions of a viaduct along Eighth Avenue South that would carry street traffic above the railroad tracks. It was to be entirely financed by the railroads.

In 1931, the grade separation for Oregon-Washington (Union Pacific), Pacific Coast and Northern Pacific Railways had been completed by the companies, and it remained only to make the approaches usable.

During the 1920s initiative petitions had been circulated to restore to the municipalities of the state the jurisdiction in franchise matters which had been gradually assumed by the State. Edward D. O'Brien, who had held the position of Assistant Superintendent of the Department since its organization in 1908, died on June 2, 1924, and soon thereafter the position of Assistant Superintendent was abolished. The Chief Draftsman was made Utilities Engineer. The Department then consisted of the Utilities Engineer, five inspectors, a draftsman and a clerk.

As indicated in Chapter 10, the Department of Public Utilities was abolished by popular vote in March 1931, and an ordinance of August 15 created a Division of Public Utilities, which was placed under the jurisdiction of the Board of Public Works. The Board then almost immediately transferred it to the Engineering Department, the Weights and Measures

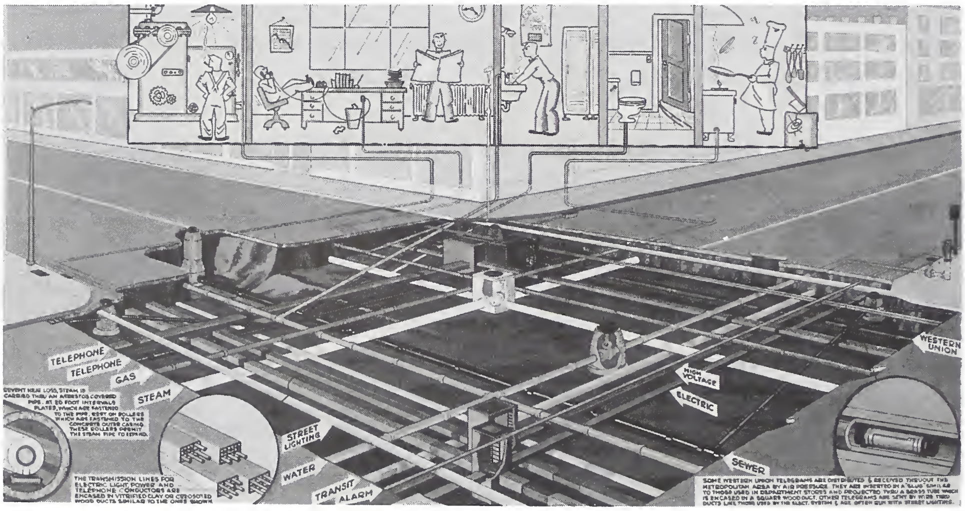
Department being at the same time transferred to the Comptroller's office where it more properly belonged.

The Public Utilities Division keeps complete records of the use of subsurface areas in the City streets and regulates the various activities involved in both privately and publicly owned installation. Railroad franchises and agreements continue to make up a large portion of the department's work.

From the 1913 Annual Report of the Department of Public Utilities the following letter from a local engineer was taken:

"I have done a great deal of work for my company in the different streets of Seattle. During the old system there was no complete record kept of any streets or work done in the streets, i.e., there was no complete record of mains or ducts which would be a guide to any one wishing to do underground work.

"To one not familiar with this kind of work it might seem that these things are of little value, but I deem it an absolute necessity for any City to know where all pipes, sewers, ducts, etc. are located. I find now a very different proposition when doing work in the streets. Since the creation of the Public Utilities Department I have always been able to get a true and direct location of the different pipes, ducts, etc. installed subsequent to that time. It seems that under the old system when a man got a permit to run a certain line or duct, he simply took the easiest route, not attempting to keep


TELEPHONE
TELEPHONE
GAS
STEAM
PREVENT HEAT LOSS, STEAM IS CARRIED THRU AN ASBESTOS COVERED PIPE. AT 20 FOOT INTERVALS PLATES, WHICH ARE FASTENED TO THE PIPE, REST ON ROLLERS WHICH ARE FASTENED TO THE CONCRETE OUTER CASING. THESE ROLLERS PERMIT THE STEAM PIPE TO EXPAND.
THE TRANSMISSION LINES FOR ELECTRIC LIGHT, POWER AND TELEPHONE CONDUCTORS ARE ENCASED IN VITRIFIED CLAY OR CREOSOTED WOOD DUCTS SIMILAR TO THE ONES SHOWN
STREET LIGHTING
WATER
TRANSIT
ALARM
HIGH VOLTAGE
ELECTRIC
SEWER
WESTERN UNION
SOME WESTERN UNION TELEGRAMS ARE DISTRIBUTED & RECEIVED THRUOUT THE METROPOLITAN AREA BY AIR PRESSURE. THEY ARE INSERTED IN A "SLUG" SIMILAR TO THOSE USED IN DEPARTMENT STORES AND PROJECTED THRU A BRASS TUBE WHICH IS ENCASED IN A SQUARE WOOD DUCT. OTHER TELEGRAMS ARE SENT BY WIRE THRU DUCTS LIKE THOSE USED BY THE ELECT. SYSTEM & ARE OFTEN RUN WITH STREET LIGHTING.

A typical downtown street intersection, illustrating the maze of underground piping, ducts, watermains, sewers and other structures, the exact location of all of which must be known before any major construction or repair can be attempted. More than one engineer has come to grief by designing an underground installation without knowing precisely where the existing ones were.

in the location laid out by the City, and the reason, no doubt, for this was that many locations as shown on the old maps were found to be faulty. I cannot help but think that the value of the Public Utilities Department in the City of Seattle cannot be estimated too highly as now every company is required to remain in its own location as given by that Department and in future years the records kept by this Department will be of great value to the City as well as to the public utilities of the City. It has been a great help to be able to get locations to enable us to do work in a satisfactory manner.

"The public does not realize that underlying the streets of Seattle is a network of pipes and ducts of all description of which there should be a true record for the benefit of those wishing to do underground work."

Recording location of underground utilities continues to be an important function of the Public Utilities Division of the Engineering Department.

CHAPTER 11

Water Supplies Cedar River Development

FROM the time of his appointment as City Engineer in 1892, R. H. Thomson was concerned with the problem of obtaining a sufficient and healthful water supply as well as with the construction problems of the growing city. The engineers realized that the water from Lake Washington would not be satisfactory as a source for domestic use for very long, as signs of pollution in the lakes were becoming evident even at that time. Though community opinion was vigorously divided, Thomson persisted in his efforts to tap the Cedar River water supply. In the summers of 1896 and 1897, he completed the survey of the Cedar River pipeline right-of-way, as proposed in the 1889 report by Benezette Williams, outstanding hydraulic engineer of Chicago. First Cedar River water was delivered in 1901. Land acquired on Beacon Hill for two of the receiving reservoirs included some excess acreage which Thomson suggested, in a 1900 report, would be a likely site for a golf course. Today it is the Jefferson Golf Course.

The development of this source of water and the gravity system which is the basis of the City's modern system has twice been the subject of book-length historical studies. John Lamb, in 1914, originally compiled the story which was published by the Water Department under the title "The Seattle Municipal Water Plant." This was expanded and updated by Mary McWilliams in 1955 and published under the title "Seattle Water Department History: 1854–1954."

In the early 1950s changes were made in Cedar River Supply lines and storage facilities, but increasing populations and even more rapidly in-

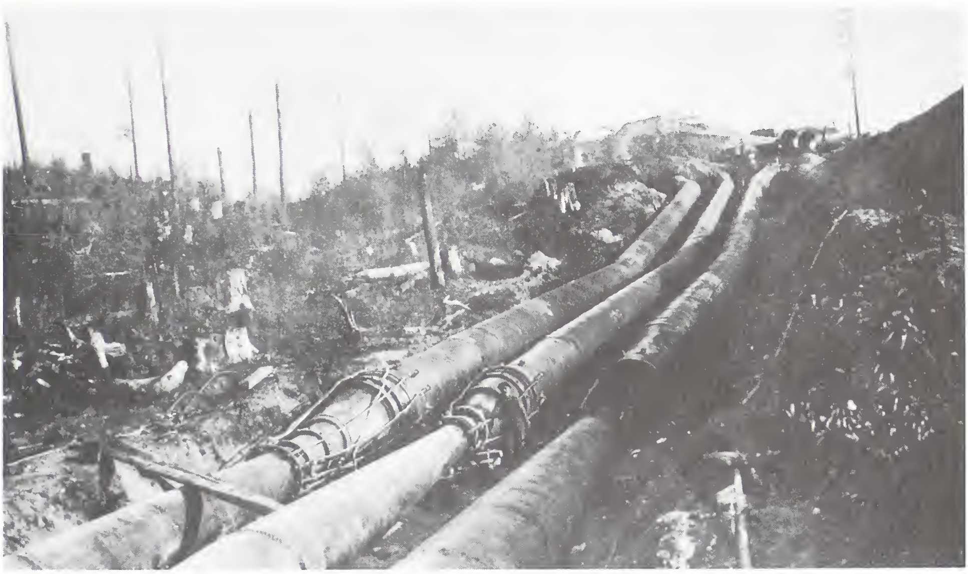


Photo Courtesy Mrs. June Gasparovich, daughter of Ira B. Shinkle

Cedar River Pipe Lines #3, 1 & 2 Left to Right at Control Works 1925

creasing per capita consumption still caused summers to be periods of potential crises.

Per capita consumption in 1890 had averaged about 10 gallons per day; by 1913, it was 72; and the figure for 1970 had soared to 142. During four summers prior to bringing in the Tolt River water in 1963, emergency regulations concerning lawn sprinkling and other uses of water were promulgated by the Water Department.

Flood control on the Green River had brought industrial expansion in the Duwamish Valley and this added to the urgency of increasing the City's water supply.

In a 1952 report, prepared by H. Ward Tyler, Principal Design Engineer, to the City Council, City Engineer Ralph W. Finke and Water Superintendent Roy W. Morse recommended that the Tolt River be developed as an alternate source of water for the North Seattle area.

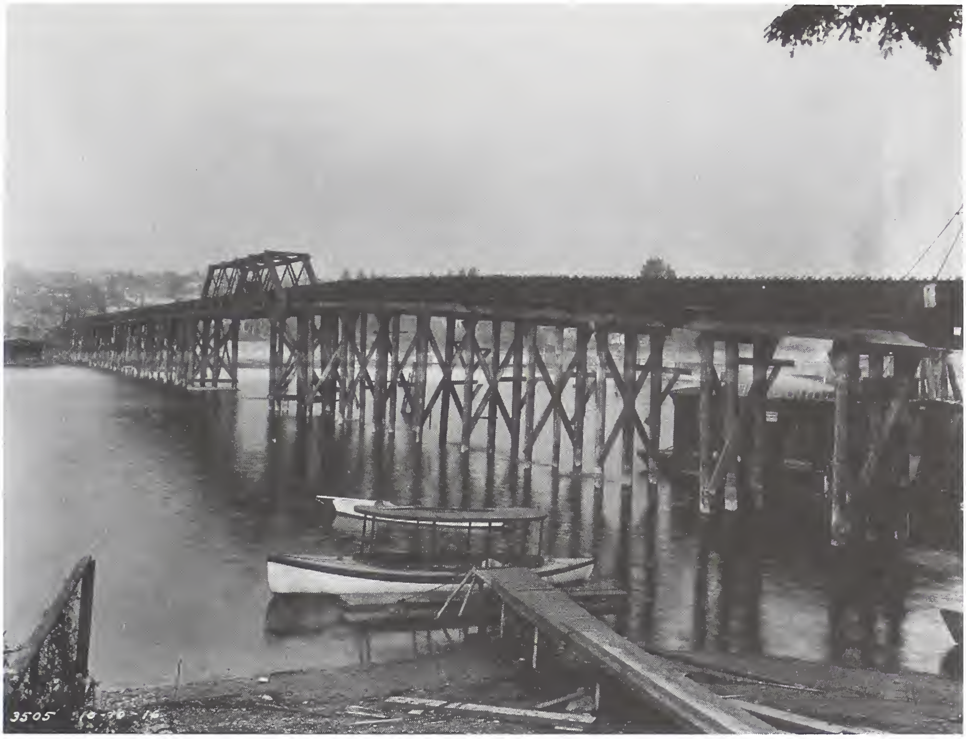
TOLT RIVER DEVELOPMENT

The Tolt River is the second large unit in Seattle's water supply system, the Cedar River development of 1901 having been the first. Cedar River has the capacity for a much larger supply but it was considered desirable to have a second source of water available to the City and to have

The Volunteer Park Reservoir, completed in 1901, one of the Seattle Water Department's earliest, (the developmnt plans date back to the early 1870s) is here shown undergoing repairs, April 15, 1922; including repair of the gate house and relining of the reservoir.

each system large enough to supply a minimum of water should either system be shut down for any reason.

The first comprehensive study of a supplementary source of water supply appears in the records of the Engineering Department in 1936; it was made by Lars Langloe, a Civil Engineer in Olympia. The area surveyed extended from south of the Tolt River to its North Fork. Gauging stations were placed on the river by the State and U. S. Geological Survey and application for water rights was made to both State and Federal authorities by the City. A temporary decline in population and press of other work delayed progress in developing the new source, though stream flow data records at the gauging stations and aerial surveys and map making kept the City's water rights effective. Logging operations in the intervening years made the area more accessible and studies continued during the 1940s. To gain effective control of the watershed, the Water Department arranged for exchange of City land for reservoir basin land owned by the Weyerhaeuser

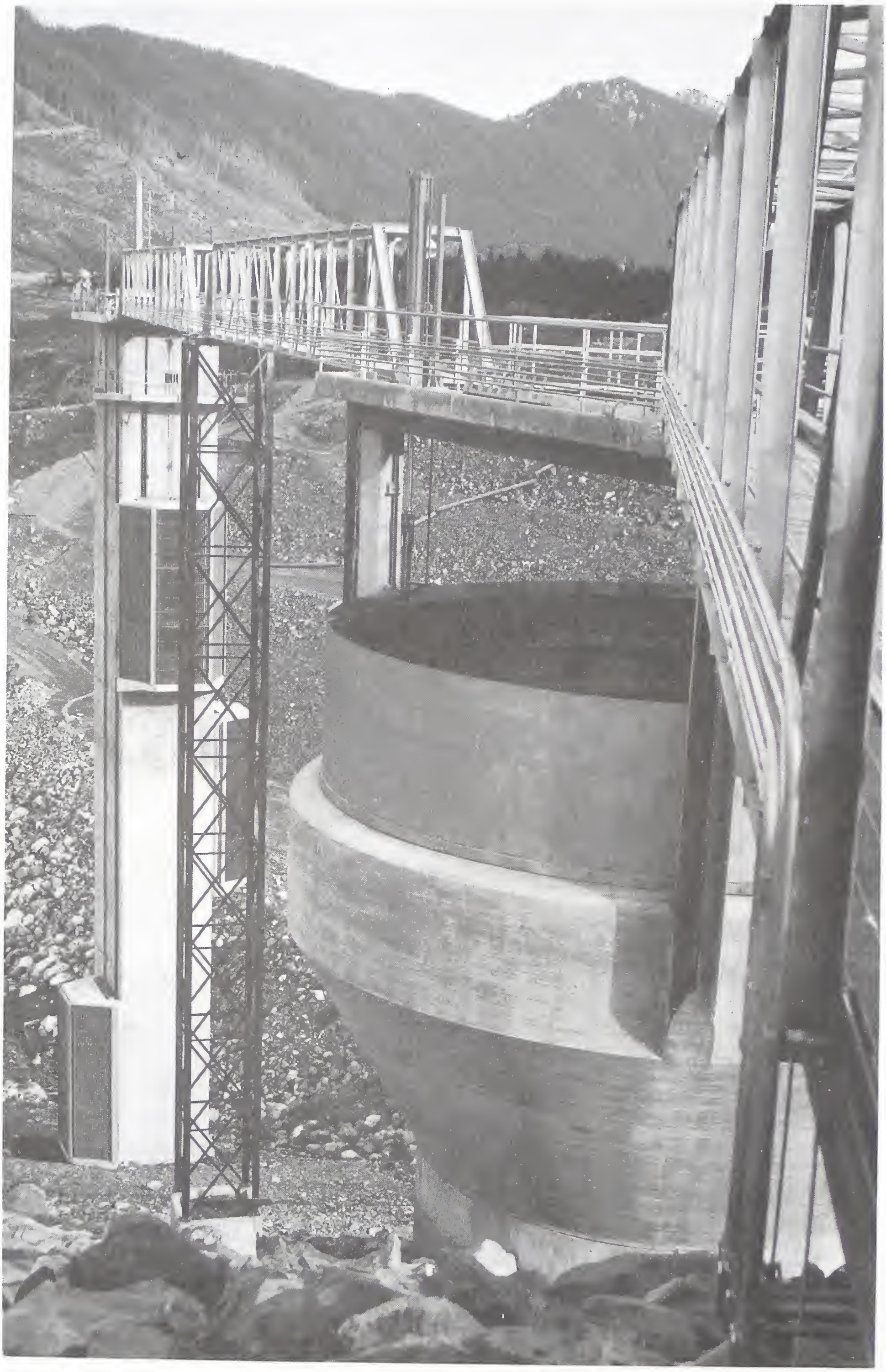


This structure, crossing Lake Union at 7th Ave. NE, supported the wooden stave aqueduct that carried Northeastern Seattle's water supply until it was replaced by the Lake Union Water Works Tunnel, built in 1914 and 1915.

Company, and agreements between the City and the company were aimed at control of the watershed by the former.

In 1951 the City Council, by Ordinance No. 80109, directed City Engineer Finke to make studies and a comprehensive plan of the Tolt River basin including aerial photographs and a mosaic of the pipe line route. Tests made in the 1950s showed that the quality of Tolt River water was comparable to that of the Cedar River. Higher elevation in the Tolt area indicated that flow by gravity to any point in Seattle was possible.

The watershed covers 58 square miles—19 square miles on the upper portion of the South Fork and 39 square miles on the upper portion of the North Fork; this is 64% of the total drainage basin. Part of the land is in the Snoqualmie National Forest and part is owned by the State and by the Weyerhaeuser Company. The forest is operated on a sustained yield basis. The City's storage dam is located above a water fall that effectively baffles migrating salmon. Release of sufficient water to preserve fish life during dry seasons was planned in connection with control of river flow.



Intake Tower and Morning Glory Spillway looking East from crest of dam South Fork Tolt River Feb. 7, 1963

A comprehensive overview of the project is provided in the August 28, 1964 Dedication brochure, partially quoted in the following:

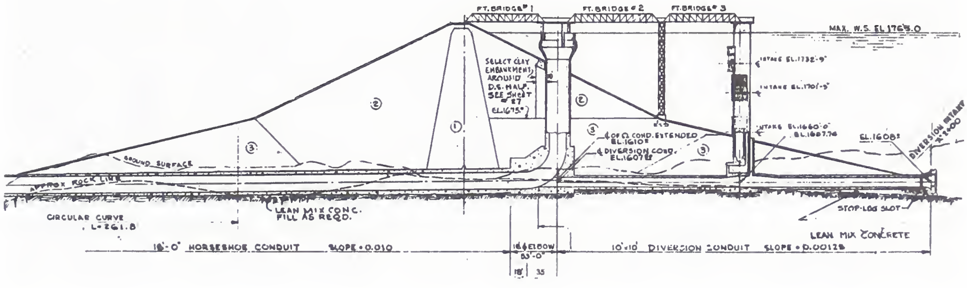
SEATTLE ENGINEERING DEPARTMENT
&
SEATTLE WATER DEPARTMENT
DEDICATION
OF
TOLT RIVER—SOUTH FORK DAM
Honorable J. D. Braman, Mayor
Seattle City Council
Clarence F. Massart, President

Paul J. Alexander	A. L. Kramer
Charles M. Carroll	Wing Luke
Mrs. H. H. Edwards	Floyd C. Miller
Ray L. Eckmann	M. B (Mike) Mitchell

Board of Public Works

Roy W. Morse, Chairman City Engineer	John M. Nelson Superintendent of Lighting
J. Ray Heath Superintendent of Water	Fred B. McCoy Superintendent of Buildings

August 28, 1964



Cross-section-Tolt Dam

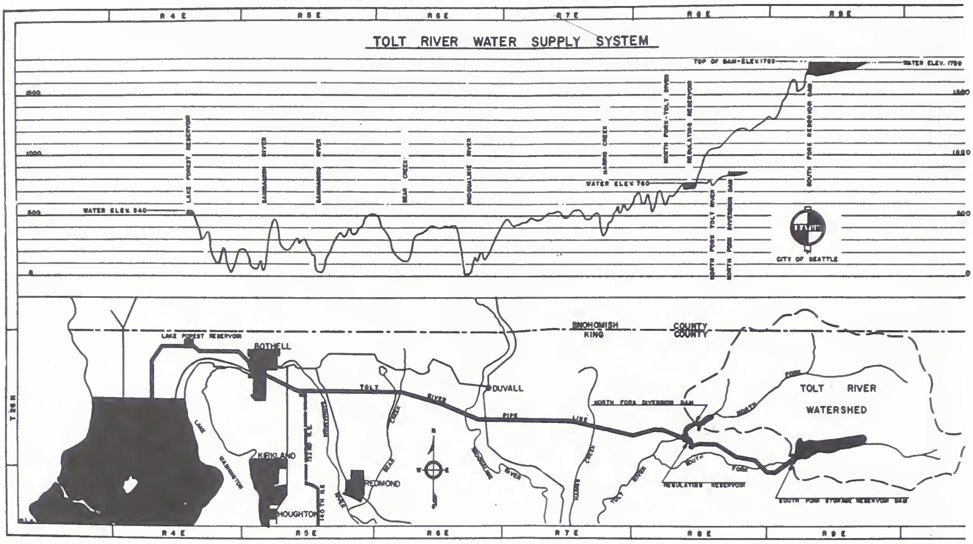
TOLT RIVER WATER SUPPLY PROJECT

The Tolt River Project is a new source of water supply for the City of Seattle and communities north and east of Lake Washington. The source of water is the South Fork of the Tolt River watershed which lies in the Cascade Mountains, 30 miles due east of Seattle.

Features of the first stage of this project include the South Fork storage dam, clearing of the storage reservoir, 5 miles of pipe line from the dam to the regulating reservoir, a 300-million gallon regulating reservoir, control works and headquarters buildings, chlorination station, 25 miles of pipe line to the receiving reservoir, and the 60-million gallon Lake Forest Reservoir. The overall cost of the first stage of this project was $25,000,000.00. It has a capacity of 90-million gallons per day.

The project included the following construction contracts:

Project	*Cost*	*Contractor*
Tolt River Dam	$7,700,000	Anderson—Wilder
Clearing of South Fork Storage Reservoir	933,500	Strong & MacDonald
Upstream Blanket for the Tolt River Dam	1,100,000	Osberg Construction Co.
Downstream Toe Drains for the Tolt River Dam	80,000	Osberg Construction Co.
Tolt River Pipe Line No. 1		
Schedule No. 1	100,000	Willar Construction Co.
Schedule No. 2	380,000	J. J. Welcome Construction Co.
Schedule Nos. 3, 4, 5	8,400,000	Valley—M-K Company
Schedule No. 6	1,090,000	Valley—M-K Company
Tolt River Regulating Basin	2,500,000	Highway Construction Co. &
Unit No. 1		Emil Anderson Construction Co.
Unit No. 2	200,000	Stevens Construction Co.
Unit No. 2A	25,000	Valley Construction Co.
Unit No. 3	275,000	Willar Construction Co.
Unit No. 4	25,000	Service Electric Co.
Lake Forest Reservoir	1,200,000	Mutual Construction Co.
Chlorination Building	30,000	Ferrell and Penning



Water Supply System—Tolt

TOLT RIVER
SOUTH FORK DAM

Type —Zoned earth fill dam
Height —200 feet above river bed
Crest length—900 feet
Materials —315,000 cubic yards impervious core
630,000 cubic yards sand and gravel shell
375,000 cubic yards random fill
140,000 cubic yards rock riprap

Spillway —40-foot diameter morning glory spillway with 18-foot diameter shaft and 18-foot horseshoe conduit
Reservoir capacity—57,900 acre-feet (19 billion gallons)
Area of Reservoir—1,090 acres
Construction started—March 1959
All contracts completed—October 1963
Reservoir first filled to top of ring gate—May 20, 1964

The planning and design of the Tolt River Project continued through the term of three City Engineers—Ralph W. Finke, W. E. Parker and Roy W. Morse. Carey & Kramer, consulting engineers, were engaged to design the Dam. Shannon and Wilson were the soils engineering consultants. Dr. Howard Coombs, Stirling Hill and William Shannon, Jr. served as a Board of Consultants for the City.

The overall design of the project was prepared in the Seattle Engineering Department Design Division under H. Ward Tyler, Principal Engineer. Field construction was supervised by the Seattle Engineering Department Construction Division under E. H. Lindstrom, Principal Engineer.

The entire project was built with Seattle Water Department funds and will be operated by the Water Department, J. Ray Heath, Superintendent, and Jesse Ramey as Director of Water Operations.

A tie-in line from Cedar River to Bothell now furnishes water to districts on Mercer Island and to other eastside communities. It also serves as a connection to the Lake Forest Reservoir so that water can be drawn from either source as required.

With the completion of the Tolt Reservoir and supply line Seattle was in the fortunate position of having, at last, two independent and reliable water sources, either of which was capable of supplying the entire City's needs under normal conditions.

While the first storage basin and pipe line were built tapping the South Fork of the Tolt River, future development is proposed to bring in a line from the North Fork also.

CHAPTER 12

The Depression and the Alphabetical Agencies

THE depression of the 1930s had a near catastrophic effect on the City and its activities, even as it had on individuals. The City set aside $100,000 to alleviate some of the need among its people, and an unemployment bureau was established in the Streets and Sewers Department, its supervision being delegated to the superintendent of that department.

Fifteen thousand unemployed were registered but the Department had no authority to check the need of individual cases. An attempt was made to rotate the work by allotting it in accordance with the number of people in each family, progressing from families of twelve or more on down to those of lesser numbers. The representatives from the larger families received proportionately more work than those from the smaller families before they were replaced by another crew from the next smaller family group. This worked satisfactorily until influential people began to ask favors for their friends.

The City was petitioned by some of the unemployed for permission to plant gardens on tax title lots in suitable locations, and in some instances City equipment contributed to the neighborhood effort by ploughing such lots or otherwise aiding in preparation when such activities could be worked into the regular schedules.

Representatives from the City Council, the Water Department and the Corporation Counsel's office met with officials of the Reconstruction Finance Corporation (RFC) in Washington, D. C., in 1932, to arrange for relief in the Seattle area. RFC agreed to purchase City Water bonds in the amount of $1,491,000 to finance work on the Cedar River No. 1 Replacement Pipe Line, Intermediate Service to Seward Park, Intermediate Service to Kenyon Street Pumps, watermain on Denny Way and Bell Street, Slope Dressing and Drainage for the West Seattle Reservoir, West Seattle Low Service Distribution, Wood Main Replacement on Alki Avenue, New Basin at the Maple Leaf Reservoir, an Intake Dam at Landsburg, and Shore Improvement at Lake Youngs. The contracts let for this work supplied much needed income to many unemployed in the area.

Another proposed relief measure was a bond issue of $1,128,000 submitted to the voters to finance various highway improvements and to supply work to another thousand men for a period of nine months. Fourteen projects under this appropriation were started during 1934, all of which were worthwhile. Many had been contracted for under the pre-Depression prices. Local improvement initiative became almost nonexistent during the Depression years; and people refused to approve either assessments or bond issues. Preparation of plans and estimates to comply with requests for Federal Aid were criticized as being inefficient and recommendations were made for a better overall plan to take advantage of the relief measures.

In 1933, Reconstruction Finance Corporation funds financed the replacing of a wooden watermain on Alki Avenue and a main on Denny Way from Broadway Reservoir to the downtown business district and the waterfront. Wood stave pipe was rebuilt between Landsburg and Grouse Ridge and uncovered portions were covered with earth.

The State Highway Department was urged to undertake the paving of the Seattle Municipal Railway's right of way on Elliott Avenue, 15th Avenue West and 15th Avenue Northwest, from Denny Way to the north City Limits; but nothing came of this proposal. If undertaken it would probably have been halted by a court order as a result of a 1922 State Supreme Court Decision which had, in effect, stopped all subsidization of the Municipal Railway from any source and in any shape or form.[1]

Applications for Public Works Administration (PWA) grants were prepared in 1933. This work contemplated an improved bridge at Schmitz Park; Arterial Highways; the Railroad Avenue Sea Wall; the Laurelhurst Trunk Sewer; the Seward Park Trunk Sewer and the Ballard Trunk Sewer.

Washington State Emergency Relief Funds (WSERF) was also established in 1933. One of its largest projects was on Seaview Avenue which was filled and protected with riprap in 1933 and 1934. This improved access to Golden Gardens.

The Civil Works Administration (CWA) began its operations in November 1933. The City's share was relatively small in these projects, but it had control over them, working with CWA officials here and in Olympia. The CWA extended into 1934, the City receiving about $3,000,000 from this organization. One of its projects was the making of concrete blocks, at a cost of $275,000 for 66,000, for the paving of 8½ miles of double tracks of the Seattle Municipal Street Railways.

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[1] S. B. Asia et al, vs. Seattle, 119 Washington 674. This ruling is discussed in more detail in Chapter 10 (Public Utilities).

The National Recovery Administration (NRA) allotted $459,000 in 1934 to construct the grade separation at Fourth Avenue South (Argo Yard) and to grade and pave the street. Railroad Avenue Seawall and Paving, and Rainier Avenue Paving were other projects carried on during 1934 with State and Federal agency funds. A Sanitary Survey, Traffic Check and Survey, Traffic Engineering and Planning Survey were conducted. The CWA and Works Emergency Relief Administration (WERA) supplied labor for 27,000 linear feet of large trunk relief sewers, the first unit being the Henderson Street Trunk which required 4,178 feet of 42-inch precast, reinforced concrete pipe to complete. The Twenty-third Avenue Relief Sewer was started under the CWA and continued under the WERA, the City paying 35% of the labor cost and for material required beyond the original CWA purchase. The West Spokane Street sewer was a 3,160-linear foot project under both agencies. Seven other sewer projects were also completed in this program, namely: College Street; West Highland Drive, et al; Queen Anne Avenue; 4th Avenue South; Greeley Street; East Marginal Way; 4th Avenue North; and the most urgent portion of West Prospect Street in the West Highland Drive area and on Olympic Place near Kinnear Park.

In 1935, the Works Progress Administration replaced the WERA, and carried on the superseded Bureau's projects, in conjunction with the City, which, because of lack of funds, would not have proceeded alone. Local unemployed were hired as laborers whenever possible. The Schmitz Park, McGraw Street and North Queen Anne Drive Bridges were contracted during this year, among 31 projects under the PWA totaling $1,504,597. There were four WPA projects and 14 straight City contracts during this year, which with the PWA work supplied 50,571 man months of labor to alleviate unemployment.

The General Road and Bridge Fund was abolished by the legislature in 1933, leaving a $100,000 balance to the City's credit. This money, and other money due the Fund, was to be used in the Secondary Highway Fund of the County. The City's $50,000 balance was used as matching funds with PWA funds which allowed 45% grants from the Federal Government.

PWA and WPA grants continued into 1939 when the last of the aid projects were nearing completion. Many thousands of dollars were spent and many needed improvements were constructed for the City's benefit with their aid before the agencies were abolished by Congress. Income to the City from various state tax law changes, such as the Motor Vehicle Gas

Tax Fund, began to be noticeable, and by late 1940, a general economic upswing in the wake of the National Defense Program was beginning to be felt in the Seattle area. Local Improvement District work picked up, especially in areas where valuations had increased, and the wheels of the City's normal business began once again to move under their own power.

CHAPTER 13

Sewers

WHEN the City Council approved the Alki Point Sewage Treatment plant early in 1957 and the trunk systems that were an integral part of it, the King County Medical Society congratulated it on the splendid beginning of this long-needed work and expressed the hope that the long-range plan would be accomplished within a reasonable time. The treatment plant was called a monument to health. Though this was but a step in the modern sewage disposal program, it was a great advance from the meager beginnings some eighty years ago.

In 1891, ten square miles of the early City drained naturally into the Sound, eight square miles into Lake Union and ten square miles directly or indirectly into Lake Washington. This amounted to 65% of the City's area draining into fresh water lakes surrounded or bordered by the City. Cesspools had taken care of the drainage until epidemics of typhoid and diphtheria made inroads on the health conscience of the population and more adequate procedures were demanded.

Colonel George E. Waring was engaged to devise a system of sewerage, and in March 1889 he presented a plan recommending a "separate system" for sanitary sewage only, free from surface water. His design for intercepting sewers assumed a population of 50 people to the acre and a dry weather flow of ⅔ cubic foot of sewage per capita per day. Fifty per cent of his sewer pipes were to be eight inches in diameter. His plan would have carried the sewage from the district naturally draining into Lake Union, concentrated it at the south end of the Lake where the distance to the Sound was the shortest, and carried it via a one-mile 3 by 4½ feet oviform tunnel to the Bay. Though it was not adopted, Waring's plan did establish the idea of the tunnel.

After the fire of June 6, 1889, Lake Union rapidly developed into a cesspool, even though a local water company actually drew a portion of the City's water supply from a point on its west side. Anticipating that the City would be enjoined from discharging sewage into the lakes unless it could be shown that an effort was being made to improve the situation, the City solicited, in October 1889, the services of Benezette Williams, who was then in charge of water system development. The Council authorized the City Engineer to prepare and submit a plan for a sewerage system with Mr. Williams as consultant. The Williams' plan, submitted in 1891, discarded the "separate system" and provided for a combined system carrying both sewage and storm water. The complete system, estimated to cost $600,000, divided the City into three districts: Lake Union, Intermediate and Central, and anticipated the addition of Renton Hill and Queen Anne. Each district was to have a complete system, with between fifty and sixty miles of mains ranging in diameter from eight inches up, with tunnels, outlets to the Sound, and a limited amount of drainage into Lake Washington. The outlets to the deep water of the Bay were the main disposal plan; storm water overflow would continue into the lakes. In 1891, Mr. Thomson asserted that the outfall of the Intermediate District Tunnel should also serve as a main for the mud flat district, as had been suggested by the Williams' plan. Its construction was tied in with raising the grades of the tide lands south of King Street to the height of at least twelve feet above datum. Williams' suggestions greatly influenced subsequent plans and development in the City and a combined system prevailed for many years. With industrial development and increasingly "improved" areas, the amount of storm overflow drainage became too much for the systems to carry and many floodings and backups of short duration but great damage resulted.

Sewer bonds were authorized by the voters in June 1890. Plans were drawn and three test holes were bored on the east end of the route of the Lake Union Sewer Tunnel, which was to be one unit of the North Trunk Sewer. A shaft was sunk at the intersection of Republican Street and Lombard Street (Sixth Avenue) and work progressed from that point east toward Rollins Street (Westlake Avenue), and west toward Depot Street (Denny Way). Upon completion of construction, this shaft was connected into an inlet. No test holes were dug between Lombard Street and the Bay, and this proved to be a costly omission.

The shaft on Republican and Lombard, eight feet in diameter and lined with concrete blocks, was sunk about sixty feet to the grade depth. A pumping and hoisting plant was placed at the entrance of the shaft and excavation began simultaneously at that point and at the tunnel's bayside opening. The 5 blocks from Lombard to Rollins required about nine months to excavate. No "bad ground" was encountered and consequently there were no great difficulties, but the portion to the west was another story. Sand and gravel formation was considered "good ground" and was comparatively easy to work in, but clay cut by seams of water bearing sand, occasional boulders, jointy clay that flecked off in layers, plastic clay, and silt and quicksand that flowed like water were also encountered. The tunnel was timbered and protected as it progressed, but the face was lost time after time; a pot hole was struck which turned out to be an underground lake; and this, combined the other difficulties, forced abandonment until a better plan could be determined. Costs had greatly exceeded appropriations, and one worker had been killed in the operation.

The angle of the tunnel on Republican Street east of the Bay was changed so that it followed the center line of Depot Street. This put the sewer line in the street area and made it possible to extend the outfall to deep water entirely within the limits of public street. Its grade put some portions of the tunnel 150 feet underground. The regrading of Denny Hill removed the upper contours but the sewer is still about 50 feet below the surface.

Work on the lining of the tunnel began at Rollins Street and progressed westward behind the excavating. Hard burnt brick was used for the general work and vitrified brick for the lining. Both were manufactured here—the first by the Seattle Brick and Tile Company and the second by the Denny-Clay Company. Testing of both brick and cement was done with Riehle Brothers 1000-lb. testing apparatus, sieves and measures, a type of equipment which is still in use in the Seattle Engineering Department Testing Laboratory. Except for the cement, local products were used exclusively in the construction of the Lake Union tunnel.

Six hundred fifty feet of excavation in the west section remained to be done in 1892 but the appropriation had been almost all spent, and the work was halted until funds were available. It was fall of 1894 before the tunnel was completed.

The South Tunnel, properly known as the South Bayview Street Tunnel, was also completed in 1894. It was 4700 feet long from Elliott Bay via Bayview Avenue to Rainier Avenue. It was 48 inches wide and 72 inches high. Its grade was one foot in 350 feet from a grade point about 13 feet above datum. The Bayview Tunnel discharged onto the tide flats until 1909–1910 when the South Lander Street trunk sewer was constructed to discharge to the East Waterway. The original outfall had been planned to be carried out over nearly two miles of tide flats from the tunnel mouth at what is Tenth Avenue South, to the Duwamish Waterway, and further into deeper water as the population increased.

Waste earth from the tunnel excavation was used to build a mole or breakwater out as far as Grant Street (now Airport Way) and a pile trestle extended about 300 feet to the east channel of the Duwamish River. The outfall conduit was supported on this mole and trestle. At the same time sewage from Renton Hill was carried down Twelfth Avenue South and Lane Street and was discharged into the Bay at the foot of Lane Street where it gradually developed into an offensive nuisance.

The 1900 annual report stated that the Bayview Tunnel had been completed in about 1893 but had not been put into use. The recommendation was made that the Twelfth Avenue and Rainier Avenue lines, as well as Walla Walla Street, (in the vicinity of 21st Avenue South and 23rd Avenue South) and Twenty-sixth Avenue sewers should be connected to and discharged through this tunnel. The Rainier Avenue Trunk from Yesler Way to Bayview Street and the correction of low flow to the Bayview Street Tunnel was completed in 1906–1908 with overflow to the low area on the south. The next reference is in the report of 1908: "A small part of the central portion of the City, naturally draining towards the south, has been provided with a main sewer, known as the Rainier Valley Trunk Sewer, which now discharges through the South Tunnel on to the tide flats at the foot of Bayview Street. At a very early date, this discharge will be carried westward to the East Waterway."

In the 1920s, development spread south in Rainier Valley. Additional combined sewers and health problems developed simultaneously. The systems discharging to the Wetmore Slough area were contaminating Lake Washington and creating health hazards. It was therefore decided to construct a new tunnel for additional capacity and to serve a larger area. This was the South Hanford Street Tunnel, completed in 1930. The South Bayview Street Tunnel was abandoned at this time and its flow diverted to the new tunnel. The Charlestown Street Tunnel and pump station between Rainier Avenue South and Lake Washington, completed in 1931, diverted low flows to the new south branch of the Rainier Valley Trunk carrying flows to the South Hanford Street Tunnel.

On February 22, 1894, sewer construction, which had hitherto been under direction of the Superintendent of Streets and Sewers, was transferred to the Engineering Department. An expense sheet from the Department's 1894 annual report for one week of tunnel lining itemizes the costs as follows:

DETAILS OF COST

of 186 feet of 48″ by 72″ brick lining in the
South Sewer Tunnel.
Average delivery of materials, 3300 feet

Labor:			
	(Foremen, 6 days at $3.00	$ 18.00	
Excavating Invert,	(Laborers, 41½ days at $1.60	66.40	
	(Foreman of brick work, 6 days at $5.00	30.00	
	(Brick Masons, 27½ days at $4.00	110.00	
Masonry,	(Tenders and car-pushers, 86 days at $1.60	137.60	
	(Foreman, 6 days at $2.25	13.50	
Back-filling,	(Laborers, 23½ days at $1.60	37.60	
Carpenter and Blacksmith, 6 days at $2.50		15.00	
Total cost of Labor			$ 428.10
Materials:			
Brick,—44,082 at $10.00 per M		$440.82	
Cement,—52 Casks at $2.70 per cask		140.40	
Sand,—25 cubic yards, at $0.80 per cubic yd.		20.00	
Gravel (for back-filling) 18 cu. yds. at $0.40		7.20	
Supplies—Oils, Lamps, etc.		15.46	
Total cost of Materials			$ 623.88
			1,051.98
Office Expense at Tunnel			13.22
			$1,065.20
Deduct cost of 5 feet of Invert at $4.20			21.00
Total cost of 186 feet of completed lining			$1,044.20
Total cost per lineal foot		$5.612	

Many brick and vitrified clay pipe sewers were built in an attempt to eliminate the use of the old wood box drains which had served in the beginning and were in danger of collapsing, or had already failed to function. As experience was gained in the construction of the sewer tunnels and pipes, costs were cut down as much as 10% from one year to the next.

The 1892 annual report stated that at least fifty miles of main and lateral sewer should be built within the next three years. The sewer construction bonds of 1893 provided funds for some two dozen main sewers of various lengths, to be located where they were most needed for proper sewerage and drainage of the City. The lateral sewers were charged to the abutting properties in accordance with the Charter amendments of March 1894. Though owners were slow in petitioning for construction of laterals, by 1909 a grand total of 270.04 miles of lateral sewers had been completed.

The North Trunk Sewer absorbed the attention of the Department in 1911. It drained a large area north of the Ship Canal, much of Capital Hill and the entire drainage slope to Lake Washington for about four miles south of the Madison Street Ferry Landing, and incorporated the Green Lake and Lake Union sections, previously completed, into a combined drainage area of about 30 square miles. Green Lake sewer had previously emptied into Salmon Bay. The concrete and brick bridge-like structure which crosses the Lake Washington Boulevard at about Lynn Street is really a sewer main crossing over low ground in the Washington Park area and is part of the North Trunk system. It was designed by the firm of Wilcox and Sayward and in 1963 was given a Chapter Citation Award by the Seattle Chapter of the American Institute of Architects.

The Licton Springs drain line, 18″ to 24″ clay, into Green Lake, became the object for many "moonlight" house sewer connections. In January 1931, it was changed over to the North Trunk Sewer.

The problem of the sewers crossing the Lake Washington Ship Canal was solved by carrying them through tunnels at Third Avenue West and at the Portage (Montlake). These tunnels were planned to accommodate all utilities that would need to cross the Canal and were built in lieu of complying with the Federal rule that all electric wires should be 200 feet above the Canal, which would have involved the building of high towers on either side of the crossing. Future dredging operations also were considered to be a hazard to any mains on the lake bottom. The Portage siphon tunnel was built in 1911, apparently with little difficulty, and was in use at the time of the annual report of the following year, and the Third Avenue West siphon was under construction.

Construction of the Third Avenue West tunnel presented difficulties in the form of a layer of quicksand some 20 feet below the surface, under which was a layer of hard pan. The shafts on either side went down to a depth of 80 feet and a tunnel, 14 feet wide by 12 feet high, inside dimensions, and 21 feet wide by 20 feet high, outside dimensions of the timbering, then passed under the Canal. Its construction required the services of miners skilled in soft ground work, in addition to the engineers, mechanics, carpenters and others. The crossing was completed in 1912 and the 60-inch cast iron sewer main was then laid through it and put into operation, followed, in 1914, by a second 60-inch main. This formed a link in the North Trunk System to the line in Commodore Way that discharged into the Sound at West Point, thus relieving the pollution developing in the Lake Washington Canal. Through the years it has been necessary to construct other submarine crossings of the Ship Canal.

The engineers had known since early in the 1890s that the City must ultimately stop discharging sewage into the lakes, rivers, and Sound, but lack of money and public indifference prevented any definite action being taken for many years. Most construction was planned so that the various units could be incorporated into a sanitary system that would provide interception and treatment of all wastes. In 1916 there were 440 miles of sible to meet this unexpected obligation without straining the City's General Fund."

As a result of the Ravenna Sewer break the Engineering Department instituted a program of regular and intensive sewer inspection using photographic equipment. This progressed from the walk-through method to a float-through or skid-mounted device with automatic cameras. With the advent of the float-through or skid-mounted cameras, (the special housings for which were built by the Department), it was decided that a series of still photos taken at short intervals would be satisfactory. Operating procedures were then worked out to cover the different sewers, and the first photo inspections were made in sewers of 15 inches to 144 inches in diameter. Color film is used as it gives better contrast when projected and also shows up the various mineral deposits.

The 35-millimeter inspection was used from 1960 until 1963, when a TV camera was added to the equipment to extend the photographic inspection to sewers ranging in size from eight inches to fifteen inches in diameter. The TV program provides on-the-spot continuous viewing and, where necessary, the screen picture can be made a permanent record by photographing the screen image. These pictures can be used for comparisons with later pictures to check any questioned location or development. Camera inspection is considered the fastest and most efficient method; the TV method is preferred as the permanent record is made of only the trouble spots. It is operated by five men and two trucks.

Seattle's Sewer Utility Accounting and the first round of rates in conjunction with the Metro Sewage program were established by ordinance in 1965. The amount of water used and the size of the pipe service to the premises governs the rate; any water in excess of the minimum quantity allowed was billed as six cents per 100 cubic feet. Other rates for other classes of users were also established. But sewage disposal control in Seattle by itself was only a token effort when pollution of all surrounding waters by the expanding populations went unchecked. While making a great effort to keep its premises clean and to protect its water front and lakes, the City was helpless to control any of the other populated areas which were still indifferent to the overall situation. It became increasingly evident that preserving the cleanliness of our valuable water borders was a job not only for the settlements along the shores but for everyone living in the surrounding drainage basins, and this required an administrative authority stemming from a Metropolitan Government.

As early as 1925, it was recognized that the City Sewage System would have to be integrated in some fashion with outlying territory if it expected to exercise any influence over sewage disposal in the various districts. In 1927 a Municipal League Committee on sewage disposal recommended that the engineers of Tacoma, Seattle, Everett and their respective counties form a cooperative group for conferences and action to solve their common sewage disposal problems.

Other groups were organized from time to time to deal with the ever-growing problem of sewage and refuse disposal, but no effective or concerted action was taken until the King County Pollution Control Commission, early in 1956 issued a comprehensive proposal for a Seattle-King County Metropolitan Municipal Corporation "with sufficient scope and authority to contract and operate the required utility services within a reasonable period of time." Placed on the ballot at the election of March 1958, the proposal failed, despite a massive publicity campaign. Six months later, with the sewage pollution problem becoming daily more critical, and with public opinion having become somewhat more enlightened as to the magnitude of the problem and the inability of the City to solve it alone, the Metro proposal was adopted by the voters of King County and Seattle at the September Primary election.

Sewer charges in the City had to be increased to cover construction costs for comprehensive Metro systems and to support the City's local lines, which became, in effect, a side sewer system, dependent on the Metro mains. Seattle users were assured that residence rates would not exceed $2.50 per month, which quieted some fears that the City would be supplying sewerage services for all the outlying communities.

The Metro facilities are available to all communities which pay an established fee per residential unit for the service. Communities not wishing to become part of the plan are required to establish their own treatment and disposal facilities which must meet the standards of the State Pollution Control Commission and health authorities. Untreated sewage is no longer permitted to be discharged into the fresh water lakes, and all must be treated before release of effluent to the Sound or to any river flowing into it.

Plans were made to provide complete sewage treatment for all municipalities lying in the Lake Washington and Lake Sammamish drainage basins. Since 1958 all sewage plans have been considered temporary unless approved as part of the Commission's long range program, and this regulation has profoundly affected the City's own sewer design program. Some inequities were apparent in the early rates. Water for garden irrigation purposes was added to the winter average use, and the combined water and sewer charge was computed on this total. This procedure has been changed with the yearly charge being based upon the average amount of water consumed monthly during the minimum six-month use period of the year.

Commercial users are able to meter water that can be discharged into storm drains or natural drainage outlets instead of into sanitary sewers, and are exempt from sewer charges on such water.

Water used in cooling systems and recirculated from a cooling tower is not chargeable, and the same is true of water used in manufacturing food, drink products or ice. Such items reduced the income of both the City and Metro, and contributed to the subsequent rate increase. Two dollars out of every monthly residence fee and a proportionate amount from other user fees goes to pay the City's bill to Metro, and the balance goes into the City's Sewer Fund for other sewer expenses.

CHRONOLOGICAL HISTORY OF SEWER CONSTRUCTION IN SEATTLE

1851—Settlers investigated Seattle area in June and settled on the Duwamish River, south of the City, in September. In late September, Alki Point was settled.

1852—October—H. L. Yesler arrived from Portland, intending to set up a sawmill. Land was given to him by Boren and Maynard where their claims joined, and the sawmill opened in 1853. Seattle's name and plat was established prior to his arrival. Lumber shipped to San Francisco and China.

1853—August 22, a post office officially opened in Seattle. Prior to that, postage came by way of canoe from Olympia, 25 cents per letter, and as much as 4 months' time elapsed from posting date in the east. This year there were 170 white settlers in King County of whom 111 were men and voters. L. M. Collins raised a crop worth $5,000 on his claim by the Duwamish, south of Seattle.

1854—Cholera claimed 10,675 lives in London and forced the construction of sewers. 1146 miles existed in 1855 and a program was in full swing in 1859.

1870—First bathtub with plumbing in Seattle.

1875—Seattle had a diphtheria epidemic and family groups of four perished.

1876—Many children under 10 died, and cases were rare where a sick child became well.

1880—Population of Seattle—4,533.

1882—Wooden box sewer built in Yesler Way, west of 3rd Avenue.

1883—Northern Pacific Railway completed.
Sewer built of vitrified clay pipe in Union Street, from 8th Avenue to 1st Avenue.

1884—Wooden box sewers in James Street and in Yesler Way.

1885—An ordinance was passed requiring that inhabited property must be connected to existing sewers, Ordinance No. 696, dated December 5, 1885, H. L. Yesler, Mayor.

1889—Col. George E. Waring was consulted. He recommended a separate sewer system.
June 6—2:45 P.M.—Seattle Fire, downtown area practically wiped out; Tacoma, Olympia and others sent help during and after the fire. Seattle started to rebuild, requiring masonry buildings in the downtown area.

1890—Population about 43,000.

1891—Construction began on the Lake Union Sewer Tunnel. One life was lost due to the extremely difficult working conditions. Cost—$163,000—Bond Issue.

Mr. Benezette Williams was consulted, and asked to submit plans for a sewage system for the City. He recommended $534,020.00 worth of construction as follows:

(a) Combined sewers.
(b) Lake Union Sewer Tunnel from 6th N. & Republican to Elliott Bay.
(c) South Sewer Tunnel from Rainier & Bayview to Elliott Bay.
(d) First Avenue Intercepting Sewer from Madison Street to King Street.
(e) North End Trunk Sewer discharging near Salmon Bay.
(f) 248,400 linear feet of sewers from 8″ to 20″ diameter.
(g) 23,000 feet of brick sewers from 20″ x 30″ to 28″ x 42″ in size.
(h) System of local improvement assessment be adopted rather than general fund financing.

1892—Engineer R. H. Thomson recommends the construction of 50 miles of sewers to ward off a threat of cholera present on the West Coast. One-half of the population, and three-fourths of the area of the City were without sewers.

A total of 18.38 miles of clay sewers and 2.23 miles of wooden box sewers existed at the end of this year.

South sewer tunnel construction began—finished in 1895. Cost—$100,000.

1893—First Avenue interceptor sewer began.

1894—First sewer installed under Local Improvement plan—L.I.D. No. 81, Ordinance No. 3439, on Renton Avenue from Division Street to Depot Street. (Unknown Avenue from Howe Street to Denny Way.)

1895—180 miles of new lateral sewers, giving a total of 213.55 miles.
to
1908—

1897—Alaska Gold Rush.

1905—Rainier Avenue, Yesler Way to Bayview Trunk began. Total 1.56 miles, completed in 1906, cost $85,810 of which $67,260 was by assessments and $18,550 by General Fund.

1907—General sewer bond issue of $1,650,000 approved by voters.

1908—Green Lake Trunk Sewer began, 5.73 miles, from 36″ to 108″. Completed in 1911, cost $956,500 of which $756,200 paid by assessments and $200,300 from bond issue.

1909—Lake Union Trunk Sewer began, 2.96 miles, 108″ in diameter. Completed in 1911, cost $568,000, of which $485,000 paid by assessments and $83,000 by bond issue.

Lander Street Trunk Sewer began, completed in 1910, 1.18 miles in length carrying the South Sewer Tunnel to East Waterway. Cost, $159,940, of which $70,460 was by assessment and $89,480 by 1907 sewer bonds. From 54″ to 96″ in diameter.

Connecticut Street Trunk Sewer began, completed in 1910, 1.37 miles; from 24″ to 72″ in diameter, cost $148,330, of which $84,070 by assessment and $64,260 by 1907 sewer bonds; discharges into East Waterway.

1910—Lake Washington Trunk Sewer began, 5.62 miles, 21″ to 114″ in diameter. Completed 1912, cost $764,000, of which $512,350 by assessments and $251,650 by bond issue. Carried sewage from as far south as East Spruce Street to the North Trunk sewer via Montlake syphon.

1911—Interbay Trunk Sewer began, 3.5 miles, 138″ to 144″ in diameter. Completed in 1913, cost $378,890, of which $353,790 by assessment and $25,100 by bond issue.

1913—Total sewer mileage in Seattle is now 427.91 miles. One City in the United States still maintains some uncovered open trench sewers.

1913—15 trunk sewers constructed in Rainier Valley, West Seattle, South Seattle and Magnolia Bluff, from 36″ to 66″ in diameter.
to
1928—

1924—Fauntleroy Avenue Sewer and outfall in Lincoln Park.

1925—Lakewood Trunk Sewer—Alley E. of 45th South, from Lake Washington south to Oregon Street and west to Rainier Avenue, 72″ line.

1926—$2,125,000 bond issue approved by voters.
Michigan Street Trunk Sewer, Duwamish River to Airport Way via Eddy Street and Hardy Street. 70″ x 102″ near outfall.

1927—8th and 10th Avenue South Trunk Sewers in South Park—to the Duwamish River.

1928—32nd Avenue West trunk sewer and outfall constructed.

1929—West Dawson Street trunk sewer and outfall constructed. West Barton Street trunk sewer and outfall.

1930—Hanford Street trunk sewer and tunnel to Rainier Valley completed. 100″ x 150″ trunk empties into East Waterway. Rainier and Empire areas from Bayview Street to Hudson Street—trunk sewer.

1931—Charlestown Street trunk sewer carrying sewage to Hanford Street trunk sewer.
Lakeside Avenue trunk sewer—from Colman Park to Denny Blaine Place, pumping stations at East Pine and Charles Streets.

1933—43rd Avenue North trunk—East John to East Lynn Street along Lake Washington, pumping sewage to the North Trunk Sewer.

1935—Seward Park trunk sewer—from Seward Park, south to about Henderson Street.

1936—East Marginal Way trunk sewer—from Michigan Street to Othello Street (Henderson Street Trunk—Unit No. 1).

1936—E. Marginal Way Trunk, portion from 48th South to Rainier Avenue in Henderson Street. (Henderson Street Trunk Union No. 5)

Laurelhurst Trunk Sewer and tunnel in E. 35th Street, carrying sewage to North Trunk Sewer.
E. Montlake Trunk Sewer and Shelby Street pumping plant.

1937—Ballard Trunk Sewers—overflows from Market Street at 24th and 28th Avenues Northwest; two 36″ syphons under the canal at Dick Place.
E. Marginal Way Trunk—from Othello Street to Norfolk Street; pumping plant near Othello Street. (Henderson Street Trunk—Unit No. 2 and Unit No. 8.)

1939—Diagonal Avenue and East Marginal Way Treatment Plant completed. (Unit No. 10 of Henderson Street Trunk Sewer.)
East Marginal Way Trunk Sewer from Oregon Street to Michigan Street. (Henderson Street Unit No. 9.)
Norfolk Street wood stave trunk, from East Marginal Way to Empire Way, and Empire Way North to Merton Way. (Henderson Street Unit No. 3)
Empire Way to Henderson Street and Henderson Street to 48th Avenue South. (Unit No. 4.)
Henderson Street, from Rainier to Seward Park Avenues, (Unit No. 6) lowered existing pipe and built main line in Rainier Avenue area south of Henderson Street.
Pumping plant at 54th Avenue South and Henderson Street, force mains to west side of Rainier Avenue.

1941—Laurelhurst Trunk Sewer from E. 43rd Street to Ambleside Road.

1942—18th Avenue Southwest Trunk and Dumar Way Septic Tank outfall to Longfellow Creek.

1946—$3,000,000 bond issue approved to aid L.I.D.s and relief sewers, build deeper outfalls and the Diagonal Avenue sewer.

1948—25th Avenue Northeast Trunk Sewer—36″ pipe emptying into the North Trunk Sewer—overflow into Lake Washington.

1949—40th Avenue Northeast Trunk Sewer—drains into North Trunk Sewer with overflow to Lake Washington.

1953—Diagonal Avenue Pump at 5th Avenue South—pumped across the tracks into a swamp.
Henderson Street Storm overflow into Lake Washington from Rainier Avenue. Norfolk Street and E. Marginal Way overflow into the Duwamish River, Norfolk Street wood stave sewer replaced by concrete pipe.

1953—Sand Point area annexed to Seattle.

1954—Greenwood area annexed to Seattle.
North Beach Sewer District, Blue Ridge Sewer District, Greenwood Sewer District and Lake City Sewer District sewers were accepted for maintenance by the City of Seattle.
Alki Point Pump built to pump sewage to deep outfall.

1955—Portion of the Roxbury Heights Sewer District sewers being maintained by the City.

Diagonal Avenue Trunk completed, from pump at 5th South to 1st Avenue South.

1955—Creation of Seattle Sewer Utility authorized by Ord. 84390.

1956—Sewer Service Charge began in Seattle, with the rate establishd according to water service sizes and consumption of water.

1957—Sewer break in the Greenlake portion of the North Trunk Sewer between 16th and 17th N. E. in Ravenna Boulevard. East 54th and Ravenna Ave. to Roosevelt Way and Ravenna Boulevard was repaired by 1959.

1958—Additional treatment plant constructed for Lake City Sewer District—$153,180.
Harbor Avenue S.W.; Alki Avenue and 62nd Ave. S.W.—Interceptor Sewers completed. $537,000.
Alki Treatment Plant completed. $867,000.
Beach Drive Interceptors completed in 2 contracts as far south as W. Barton Street. $989,000.
U.L.I.D. #12 constructed in Lake City Sewer District up to 30″ trunk $1,760,709.
U.L.I.D. #3 up to 30″ pipe. Cost $2,364,010.

1958—Metropolitan Sewerage and Drainage Survey.

1959—Pumping Stations completed at W. Dawson Street, Lincoln Park and Murray Avenue. $453,000.
1,434.96 miles of sewers within Seattle's City Limits at the end of this year.
U.L.I.D. #16 constructed in Lake City Sewer District. Approximately $1,905,000 up to 30″ trunk.

1959—Seattle Sewer Utility Ordinance implemented by appointment of first Director in October 1959.

1960—Delridge Way Trunk Sewer completed. Up to 48″ trunk. Cost $941,000. As far south as W. Roxbury Street.
Brooklyn Avenue and Latona Avenue pumping stations.

1960—Air test for sewer leakage initially used along with conventional hydrostatic test on 51st Ave. S. Storm Relief Drain project prior to adoption as a standard test.

1961—By agreement dated January 26, 1961 the City of Seattle and the Municipality of Metropolitan Seattle contracted for delivery of sewage and industrial wastes to Metro, payment for sewage disposal, and takeover by Metro of those City facilities serving areas of greater than 1,000 acres by payment of $6,285,660.

1962—Metro charge imposed June 1, 1962. Metro takeover of 5 treatment plants, 11 pump stations, and 55 miles of trunk sewers.

1963—Construction of 40th Ave. N.E. Storm Relief Drains serving 930 acres.
Replacement at the Montlake Interchange of 114″ pipe in the Lake Washington branch of the North Trunk Sewer with two-pipes—42-inch and 108-inch inverted siphons.

1964—Construction of the 11th Ave. S.W. Sanitary Sewers and Storm Drains to serve all 370 acres of industrial Harbor Island where maximum ground elevation is 7 feet above high tide.

1965—Completion of Westlake Ave. N. project of 11 pump stations and 31,900 feet of sanitary sewers encircling Lake Union at a cost of $2 million.

April 29, 1965 earthquake damaged 600 feet of new Harbor Island sanitary sewer.

Initial installation of telemetering in 5 sewage pump stations with central panel monitor at Charles St. Shops.

1966—First unit of 4,200 feet of the Longfellow Creek Trunk Storm Drain completed at the south end of the drainage basin and 3,000 feet of 96-inch trunk line under construction at the north end in conjunction with other improvements of the 26th Ave. S.W. project.

1967—Completion of Diagonal Ave. S. Storm Drain Trunk with 8,500 feet of precast pipe 84-inch through 144-inch diameter for 4,000 acre service area at $3.7 million.

1968—Voter approval of $70 million sewer improvement program to separate sanitary sewage and storm water in 18,000 acres of 38,000 acres served by combined sewers.

1969—First 15 contracts of sewer separation program under construction for $10 million.

1970—Based on plans by the City and by consultants a total of 18 construction jobs in the separation program were awarded with construction appropriations varying between $650,000 and $2,230,000 for a total of $20 million. Completion at end of year at 20% of program.

1971—Initiation of program to modernize sewage pump stations by replacement of pumps and controls and addition of standby units in the 35–40-year old S. Alaska St., S. Charles St., and Montlake pump stations.

1972—Construction of the Downtown Sewer Replacement in the amount of $1 million designed for relining and replacing several blocks of sewer between 7th Ave. and Virginia St. and 6th Ave. and Pine St.

1973—Sewer separation program approximately two thirds complete with $50 million spent in the designated areas.

1974—Construction of Alaskan Way Sanitary Sewers to complete the City system along the downtown waterfront at a total cost of $700,000.

CHAPTER 14

Refuse Disposal

THE 1891 Annual Report of the Engineering Department mentions that the gathering of garbage, swill, night soil, etc., should be restricted to the hours between midnight and five o'clock, A.M., and that an absolutely tight-bodied wagon box should be required for the purpose. In the 1892 report the statement is made that garbage is fairly easy to dispose of—it is towed several miles out to sea and dumped for tidal action to carry out, or it may settle where dumped. This took care of the business area; citizens were left to arrange for their own garbage removal, which could be twice a week, or twice a year, and the health department anticipated that either the contract system to the lowest bidder, or a method whereby the City performed all the scavenger service with its own teams and men, would have to be adopted soon. The municipal system was believed to achieve the best results, though the contract system was more convenient for the authorities. The Bay was the prime catchall for all sorts of waste. There was no compunction about dumping refuse on a vacant lot or in an alley. It was pointed out that a new garbage scow was necessary as the old one was worn out and did not handle easily. Since it took only about 1½ hours to make the round trip to the dumping area, it seemed expedient to press the fire boat into service as a tug, as was done in several other coast cities.

This casual approach to refuse and garbage disposal prevailed in Seattle for several years. It was a sprawling town and there was ample room at not too great distances to get rid of anything that was not taken away in the barge. Early in the century private contractors collected the garbage and transported it to the various dumping grounds, the tide flats under trestles being a favored place. A slow fire was kept burning to destroy combustibles. Pig farms were part of the garbage disposal operations in most cities, including Seattle, but stock disease finally made it necessary to destroy the animals. Such farms for use of swill and food wastes were terminated here and in most other areas between 1930 and 1950 as Federal regulations requiring the cooking of swill used as hog food came into effect, increasing the cost to a point where the operation was no longer profitable.

One of Seattle's first garbage and sewage inspections was made by R. H. Thomson early in 1905 when he was sent to Europe to learn how those cities had worked out their disposal problems. In his report, which also dealt with the method used by many cities, in this country and several in Canada, he stated that the English in 1876 believed fire to be the only suitable means of removing wastes, since foods had reached such a concentrated state. The English had built two destructor cells which were still in use in 1907, though they had been slightly modified. They were dissatisfied because the material did not always consume itself and its fertilizing value was lost.

He found that the Shoreditch plant in London, built in 1897, stood in the center of the borough which had an area of a square mile, or 640 acres. It furnished steam heat for the library, hot water for two large swimming tanks, 76 bath tubs, and 50 tubs for washing clothes, and electric light for all of the buildings, and did so without producing fumes. The city library stood on one side of the plant and the municipal baths and wash house on the opposite side, neither establishment apparently experiencing any ill effects due to its proximity.

The principle of using rising gas from the early burning stages to ignite and create the heat for carrying on the burning process was used in many of these English plants. Meldrum, Warner, Goddard and Massey, and Horsfall furnaces were in use. In Burnley the destructor plant was next to a flouring mill and consumed 70 tons of refuse a day, giving off no odors. The English favored plants located in the center of the collection area to increase the economy of hauling, and advocated a destructor for every 1000 acres. These plants showed the value of the short haul and the superiority of the operation conducted on the principle of cumulative heat. Temperature in the furnaces reached 2600° F, sufficient to melt nickel and copper, which didn't adhere to the furnace bricks because of a silica-like substance that formed on their surfaces.

The German operation in Hamburg was not profitable because its plant cost too much, but Antwerp accepted a debt 25 times as large as that which Seattle had contemplated spending on the Lake Washington Ship Canal to dispose of its garbage. In all cases, area and density of population were factors in making the determinations.

As a result of Thomson's findings and recommendations work on Seattle's first refuse destructor plant began in July 1907. Plans were developed and four sites were acquired; fourteen sites in all, designed to serve an anticipated population of one million, and with each site having its own destructor, were contemplated as part of the ultimate development of the system. The fourteen districts corresponding to the destructor sites were divided into collection areas for daily, semi-daily, bi-weekly and weekly collections.

It was necessary to include in the plans a destructor capable of consuming various animals, as there was usually at least one dead horse to be disposed of every day. The Meldrum incinerator principle was the favored method, and Mr. Thomson was quite insistent on that point. As it was a patented system, the right to use it had to be planned and paid for in the beginning.

Initial plans were developed for four destructor sites. Plant No. 1 was located at the south end of Lake Union at about where the asphalt plant was later located. Power from the destructor was to be used in preparing the asphalt mixes and some steam was to be diverted for use in a nearby laundry and in a lumber kiln. Clinkers from the destructor were to be used with the asphalt road mixes and as playground cover. The plans were dated as complete on December 24, 1907. The station was ready for testing in 1908 and began operating in April of that year.

Plant No. 2 was located at North 30th Street and Wallingford Avenue, and was serviced by the Northern Pacific Railroad; it began operation July 23, 1912. Plant No. 3 was established at Ninth Avenue Northwest and West 43rd Street close to, if not actually occupying, the Ballard Tidelands. Plans were dated June 23, 1910. No. 4, the plans for which are dated January 31, 1911, was at Ninth Avenue South at Massachusetts Street.

These four destructors, the operation of which was placed under the operation of the Health Department in 1911, were used for little more than a year before they were abandoned because of excessive costs of operation, but they were still considered the most efficient destructors in the country. They could not compete with the cost of the land fill operation and Seattle then had much space that could be used for sanitary land fills. In 1913 three destructors were in operation part of the time, No. 3 having been abandoned. The brick buildings were gradually dismantled but the tall concrete chimney of the Massachusetts Street site remained until it was finally knocked down by the State during 1965 Freeway preparation.

Incineration had many advocates in 1913, who believed that an efficient operation would bring income to the City through the sale of clinker and also through saving the expense of the long haul to the dumps. Premium pay awards to employees were considered to be inducement enough to accomplish the required work without increasing the crew. The use of trucks to replace wagons and horses also was thought to add to the efficiency of the operation. But it was eventually demonstrated that, all things considered, the total cost of hauling, dumping and burying refuse was less than that of operating an incinerator. Data from European experience tending to prove the contrary was shown to be deceptive when applied to conditions on this side of the Atlantic; European refuse was quite different in composition from American, and the proportionate cost per capita was considerably less.

In 1910 the City voted to begin contracting out its municipal garbage collection system and awarded the first contracts in June of 1911.[1] City Engineer Thomson reported at that time that refuse disposal was in the hands of the Street Department, and that from time to time an inspection of the premises was made by the Health Department. This he thought to be logical as most of the refuse came from the streets and adjoining premises which were cleaned at the same time, and the refuse was hauled away in the same trucks.

The contract operation prevailed until February 1, 1915, when the Health Department assumed collection and disposal of garbage, using the City's own forces, and began covering the dumps with earth. Two garbage scows were built to haul refuse out to sea for dumping but the City Engineer was sure this method of disposal would be condemned by residents of water front property as population increased. He also thought it more satisfactory to increase the capacity of Destructor No. 2 to 120 tons per day in preparation for any such increase. The incinerators were still used for part of the disposal and the garbage scows were operated intermittently. The Health Department continued the garbage service until late in 1939 when it was transferred back to Engineering.

Nearly every City project has its advocates for public and private operation, and refuse disposal has been no exception. One firm reported in 1965 that its costs had been cut in about half because of increased competition among collectors. An on-site compactor reduced the bulk so that collection every other day rather than twice daily was satisfactory.

The crucial disposal problem brings up periodically the question of combined operation of disposal areas by county and city. A continuing education program to keep the public informed of progress in disposal methods and removal of the stigma of "garbage dump" locations should help to make it possible to develop disposal sites within shorter haul distances.

Places used as garbage dumps in the past years give some idea of the quantity and location of "man-made land" that has been developed into desirable sites for industry, parks, schools and playfields. In 1911 there were dumps at:

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[1] Prior to that date the collection had been in the hands of licensed garbage collectors, "who are licensed for the business of collecting just the same as a hack driver or a truck driver would be licensed for their particular vocations. The collector makes his own terms with the householder and is in no sense under City supervision. . . ." (Letter to Edgar C. Snyder by C. J. Moore, March 29, 1910, Letterpress Book No. 8 p. 611).

East Ward Street and 29th Avenue North—Washington Park
Gilman Avenue and 16th Avenue West
27th Avenue South and Massachusetts Street
26th Avenue Northeast and the railroads—This ran back into Ravenna Park and the University Village area
35th Avenue Southwest and West Lander Street
22nd Avenue West and West Garfield Street
Foot of Wallingford Avenue at Lake Union
Along Salmon Bay at Ewing Street
Along north side of Salmon Bay Waterway at about 20th Avenue West

In May 1920, these were listed as dumping places:

Terry Avenue, south shore of Lake Union—Private property and street
South end of Wallingford Avenue—City property
Market Street and 28th Avenue Northwest—Private property and street
North of East Madison, vicinity of 30th Avenue North—Park property
26th Avenue North and East Miller Street—Park property
West Garfield and 22nd Avenue West—Street
Foot of 26th Avenue Northeast—City property
Puget Mill property—one-half mile south of Youngstown
First Avenue South and West Dakota Street—Railroad property
Oregon Street between 42nd and 44th Avenues South—Street
Crockett Street between Nob Hill and Third Avenue North[2]
Block bounded by Dexter Avenue, Valley Street, 8th Avenue and Aloha Street in Block 9, Eden Addition
Southeast corner of 4th Avenue South and Spokane Street—Park property
The Columbia City Branch Library grounds
Green Lake field house and playfield area

Some 150 acres of land have been thus reclaimed in Seattle. Many streets have been paved over fill, and the University of Washington has reclaimed parking and recreational area on land filled by City refuse. Altogether about ten acres of private property, much of which was below street level after the grading had been done, was filled. Many owners gave permission to the City to construct sanitary fills, thus bringing their property up to street grade and making it more desirable for building sites. Sanitary fills, while in operation, are covered daily by 10 to 12 inches of earth, furnished by the City unless included among the bid items at the time of making the garbage disposal contract.

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[2] This was Seattle's first Sanitary Fill, and possibly the first in the country.

By the late 1920s agitation was growing for competitive bidding for refuse hauling. The workers' pay was considered too low to inspire much productive effort. Many open dumps were in use in 1931 but protest against having them in residential districts soon cut the number down to six.

The per unit cost of refuse disposal decreased over the years, but increased volume cancelled the savings. Between 1926 and 1931 twenty-five thousand new buildings were erected and these added to the collection problem. Many oil burners were installed in the city and, since they burned no waste, the combustibles that were formerly disposed of as fuel had to be hauled away. Since there were no ashes from the oil to be used as cover, earth had to be purchased with General Fund money. Out of every hundred dollars of City taxes, said Councilman James Scavatto, three dollars went for garbage service and was said to be the only direct return the taxpayer had for his money.

Collection procedures changed over the years; by the early 1930s all the old horse-drawn refuse wagons had been replaced by metal bodied trucks. Besides increasing practicable hauling distances and lowering costs, this changeover eliminated the vicious circle aspect of refuse collection that persisted as long as horses were used as motive power.

Garbage content also changed. By 1930 horses had all but disappeared from city streets, eliminating what had been one of the largest single disposal items two decades before; street sweepings and wooden boxes decreased from major to insignificant components of the total bulk; after World War II increasing use of home garbage disposal units markedly decreased the volume of table wastes, which was still further diminished by increasing concentration of food products. Whereas the volume had once been made up of about 65% food and table waste, 35% of combustibles and rubbish, the proportions were now practically reversed. Proper incineration could dispose of the 65% and the waste from it could be deposited in much less space than had been the case formerly; and the dump area remaining at that time, if used along with a modern incinerator, would have lasted many years.

In the 1953 garbage report made by Phillip N. Royal, one of the Department's engineers, it was indicated that Seattle's cost per family was about fifty cents per month, or two dollars per ton. His study covered twenty-two cities over the country, and of all of them, the costs for disposal in Seattle were far less than in any other city having comparable area and service.[3] By 1959, land fill costs were still less than incineration, but fill sites had become almost unavailable. Nobody wanted either county or city dumps, and all sorts of difficulties and delaying actions were placed in the way of both.

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[3] Baltimore carried on an efficient operation at one of the lowest costs—$1.56 per ton.

When it became apparent that the South Park Disposal site was not going to be adequate for the needs of the West Seattle area, an ordinance was introduced in the City Council at the suggestion of the Engineering Department to condemn the tide flat area between Harbor Avenue Southwest and 26th Avenue from Southwest Hanford Street to Southwest Florida Street. Most of this property was owned by the Nettleton Lumber Co. and by Walter Wyckoff. These owners, upon being appraised of the pending condemnation, contacted the Engineering Department in an effort to save their property. On being assured that the City wished only to obtain the legal right to develop a sanitary fill in the area, they accepted the proposal and the necessary leases were executed, giving the City the right to fill certain specified areas for a period of thirty years, while locations within the property necessary for the owners' creosoting and lumber operations were established. To complete the boundaries of the new sanitary fill, the City purchased several tracts along Harbor Avenue S.W., condemned the remaining few parcels, and added these new acquisitions of land to the small tracts which it already owned in the area. After filling had proceeded for a considerable number of years, the Port of Seattle purchased the leasehold property from the owner, with the City retaining the right to fill. In 1965, the City sold to the Port the property that it had acquired in fee for the disposal site, still retaining the right to fill until the operation was completed. Later the City released the unfilled area abutting 27th Avenue Southwest to the Port, and this property has since been filled with dredged material from the Bay and the Duwamish Waterway. Still later the Lockheed Ship Building Corporation purchased the Nettleton Lumber Company site and expanded its ship building business.

This sanitary fill provided several advantages: The owners of the property had their holdings increased in value at no cost to themselves, the City had an invaluable garbage disposal site at little cost, and it was able to sell its share of the fill site at a profit.

A portion of the University dump was closed in 1964 in response to protests from Village residents. Part of the protest had been against the seagulls which covered the dump area by the thousands. Prior to the closure, the City sought ways to abate the nuisance, and called on the services of a Falconeer and his trained Falcon, Sylvia. Standing on the perimeter of the dump area, the Falconeer released his Falcon by removing her hood. Almost instantly, every seagull on the ground took to the air, but the cloud of seagulls did not leave the area. When the Falcon returned to her master's wrist, the seagulls returned slowly to their feeding. No permanent effect was observable. End of test.

After closure, transfer of this operation to Interbay shortened the life of the latter site, which was closed to this public dumping in 1967.

January 1, 1955 was the beginning date for collection of fees from all private trucks hauling garbage to the dumps. This revenue raising measure by the Council was vigorously opposed by many business concerns as being an unfair and discriminatory charge. Composting and incineration again were being mentioned as means of disposal. The County and City joined forces in seeking a disposal site north of the City in 1956 but were denied use of a deep gulley area of some 250 acres in size by its annexation of the area to the City of Bothell. This space would have accommodated Bothell, Seattle and the County for at least 50 years.

The search for a disposal site continued. In 1957 officials were invited to study the San Mateo incineration process, newly installed, with a close eye on pollution and expense. That site was found to burn only selected materials and the yard was littered with unsightly refuse. The chimney was throwing out a dense cloud of smoke when it was inspected. The operation appeared to be a glorified sawdust burner type, with the addition of forced draft.

In 1958, County Commissioner Odell called a meeting of Commissioners and City officials from King, Pierce, Kitsap and Snohomish Counties. The land fill operation was still considered the least expensive and incineration the most costly, but no one wanted to be quoted as favoring one system over another.

A suggestion was made that a garbage railroad train be used to haul refuse to a mountain dumping site, and someone else facetiously suggested that a tube be installed underground to carry the garbage sans sight, sans odor, to the same mountain hideout. There were many owners of household garbage disposals who forgot that what went through these waste systems represented only a small percentage of the total.

In 1959 one of the state legislators said that a general garbage collection fee would relieve Seattle's problem and would be a self-help measure; until one was levied all requests for the legislature "to bail out the city" would go unheeded.

King County acquired its Maple Valley disposal site in 1960. This was to become known as Cedar Hills Disposal Park, and it was the beginning of the County's program of hauling from transfer stations to disposal sites where the garbage was to be covered every day. Prior to 1960 the County had ten dumps, eight of which were to be used as transfer stations; three of these were lost to the Freeway. The site at First Avenue Northeast and Northeast 167th Street was later changed into a transfer station.

Seattle was nearing the end of the period when all its sanitary and other services could be paid for out of the City's General Fund, and in 1961 the garbage collection fee bills went out at the rate of 4,000 daily. By the first of October the semi-monthly rhythm was established for prepaid collection at the rate of $1.25 per month per dwelling. Lesser rates applied to apartments and other units. Single dwellings were advanced to $2.00 each in 1965 and all charges were added to the water and sewer bills, payable four times yearly.

Both the City and County have been plagued with promiscuous dumping on vacant property or dead end streets, and this practice added to the expense of disposal. Garbage disposal discussion was heard everywhere. Disposal contract plans and specifications were unsettled, and all plans had articulate proponents. County and City officials realized that joining forces for joint use of disposal sites and equipment made sense. The University of Washington set September 1964 as the last date for disposal at the Ravenna sanitary land fill. The City Engineer requested a Council allocation of funds to pay consultants for an official study of the disposal problem, pointing out that the matter was becoming urgent and that a policy must soon be established.

The Black & Veatch, Frankfurter & Associates Report was submitted in 1963. It covered seven phases:

1. Estimates of present refuse quantities and future quantities to 1985.
2. Estimates of the remaining capacity and life of present disposal sites.
3. Analysis of sites for various disposal methods.
4. Determination of capital costs and annual costs of disposal by sanitary land fill and incineration.
5. Determination of probable revenues from waste heat utilization and salvage operations if a refuse incineration plan is adopted.
6. Evaluation of Seattle Disposal Company proposal.
7. Investigation of the feasibility of disposal by composting, including inspection of the operations at the two principal refuse composting installations in the United States.

The report was based primarily on Garbage Utility records for the five-year period 1957–1961, which had been made available for the purposes of determining quantities and trends from which to make future disposal estimates. Its conclusions more or less confirmed those of a 1953 Engineering Department report on the same subject; both concluded that the most economical long term refuse disposal plan suitable for Seattle was incineration, with waste heat utilization and metal salvage, combined with necessary land fill locations for incinerator ash and bulky non-burnable materials. Black and Veatch recommended that no disposal method other than incineration or sanitary land fill should be considered for Seattle. Inasmuch as the land fill situation was rapidly becoming critical, with three major disposal areas—the Ravenna site (garbage and rubbish), the West Seattle site (refuse from commercial collectors only) and the Rainier Valley site (garbage from individuals and contract collectors)—near the ends of their useful lives and scheduled for imminent closing, the incineration alternative seemed to be the only practicable one. A report on the air pollution and meteorological effects of stack emissions from incinerators had been made by a professor from the University of Washington for Black and Veatch; it recommended rigid controls of smoke and gases; but in the opinions of conservationists and others concerned with the growing air pollution problem in Seattle and King County, both the guidelines and the technology available to implement them were inadequate; their opinions convinced the voters and the whole subject of garbage incineration in Seattle was once again shelved.

Seattle Disposal Co. has long been the major contractor for garbage collection and disposal in the City, reorganizing and changing its name but not its basic ownership through the years. As contractor for collecting and disposing of trade waste, swill and commercial garbage, it operated under the name of Puget Service Co. and remained unchallenged for many years. In 1953, because of a mistake of one word in the City specifications for the five-year garbage collection contract (the word "shall" was used instead of "may") the successful bidder, City Sanitary Service, sued the City for extra money on its contract, stating that many "firms" were not placing their garbage cans in the prescribed places for collection and that the extra travel time for the collectors added greatly to the cost of pick-up. "Firms" were defined by the court as places of business and commercial activities and did not include apartment houses, churches, boarding houses and fraternities, as the company was endeavoring to establish. The contractor, nevertheless, won the suit against the City and was awarded damages which amounted to $515,000 over the life of the contract.

Extensive annexation during the 1950–1954 period added a great many residences to the number of collections, and payment to the disposal company was authorized to cover them at an agreed rate. Yearly increases in wages for the company's employees were to be paid by the City at the rate of 60% of the increase, as set up in the contract.

In 1963 the City was divided into two areas for contract bidding for the next five-year period. The National Disposal Co., a firm from Illinois, outbid the local company for the area north of Mercer Street to the City Limits and serviced this territory through 1968. Seattle Disposal Company obtained the contract for the City area south of Mercer Street. This division of the work between the two contractors added what appears to be desirable competition in the collection business. Seattle Disposal Co. is barging garbage and trade waste from commercial accounts to land fill sites in Snohomish County. This is the garbage that is collected under private contract from the various commercial concerns and is not included in the regular city collection service.

In 1964 the Sapro Company was formed by a group of Seattle businessmen who bid on the proposed disposal contracts. Associated with the Seattle Disposal Company, they expected to barge non-compostable refuse to a disposal area on property within the lands of the Tulalip Indian Reservation. Snohomish County challenged this operation on the grounds that supervisory control over the health aspects belonged in the County Department of Health and Sanitation. Although the State Supreme Court finally decided the issue against Snohomish County and in favor of the Indians, the City considered this negotiation to be a deterring factor in the City's adoption of this proposal. Moreover, the proposed contract for 20½ years with its escalating cost-of-living clause presented too many possibilities for costly changes over which the City had no control. Another undesirable item was that progress in disposal methods and machinery could make current (1966) methods outdated before the end of the 20-year contract.

The Sapro plan for composting had been tentatively rejected by the City as it had been neither satisfactory nor profitable in other sections of the country and there was little reason to believe that it would prove otherwise in Seattle.

The City of Houston, Texas, in 1968 awarded contracts to four different composting contractors, each to take approximately one-fourth of the City's unsegregated solid waste. Three plants were built, two of them produced successfully a commercial grade of compost for several months over the next two years. Both plants were closed down when it became evident the compost could not be disposed of profitably.

Faced with no alternative, the Engineering Department proceeded to design a transfer station, using pertinent features from successful transfer stations in major European and United States cities as seen by City Engineer Roy W. Morse and Assistant Director Gerard B. Fairbanks. Durham Anderson and Freed were retained as architects. The end product was to have clean "tipping floor" space for 12 private cars, a compaction pit with capacity for 2 or 3 days' accumulation, and space for 4 garbage collection vehicles emptying directly into transfer trailers. The City awarded a contract on December 15, 1965, for the South Transfer Station at Second Avenue South and South Kenyon Street. Dedication ceremonies were held September 26, 1966.[4] The Transfer Station operations met every test, and plans for an identical North Transfer Station at Wallingford Avenue and North 34th Street were approved in December, 1966. The City transfer trucks haul the refuse to either City or County sanitary landfill sites. The King County Commissioners made the County sites available to the City at the rate of $1.05 per ton of refuse.

In 1966 the U. S. Government financed a testing program to study the compression of garbage and solid wastes to a fraction of the original volume. King County, in 1966, conducted the tests on its 900-acre Cedar Hills Park Disposal site. Claims for the compressor were that such garbage did not decay or produce harmful gases; nor was it a health hazard. The machine was known as a "mole" and was claimed to be capable of exerting pressure to compact a truck load of refuse into a block which is extruded into a bulldozed ditch, and covered at once with earth. Land fill constructed with these blocks of waste reportedly was capable of supporting commercial and light manufacturing type buildings. Such fill could also triple the useful life of disposal sites. The "mole," used sporadically over several years, had mechanical and financial troubles which led to its abandonment in the early 1970s.

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[4] The Black and Veatch report of 1963 made the statement that a small transfer station would require a capital investment of $300,000 and would be chiefly a convenience for the property owners who hauled their own rubbish, garden clippings in trailers or car trunks, and other minor contributors, while at the same time it would serve as a pilot and testing plant.

CHAPTER 15

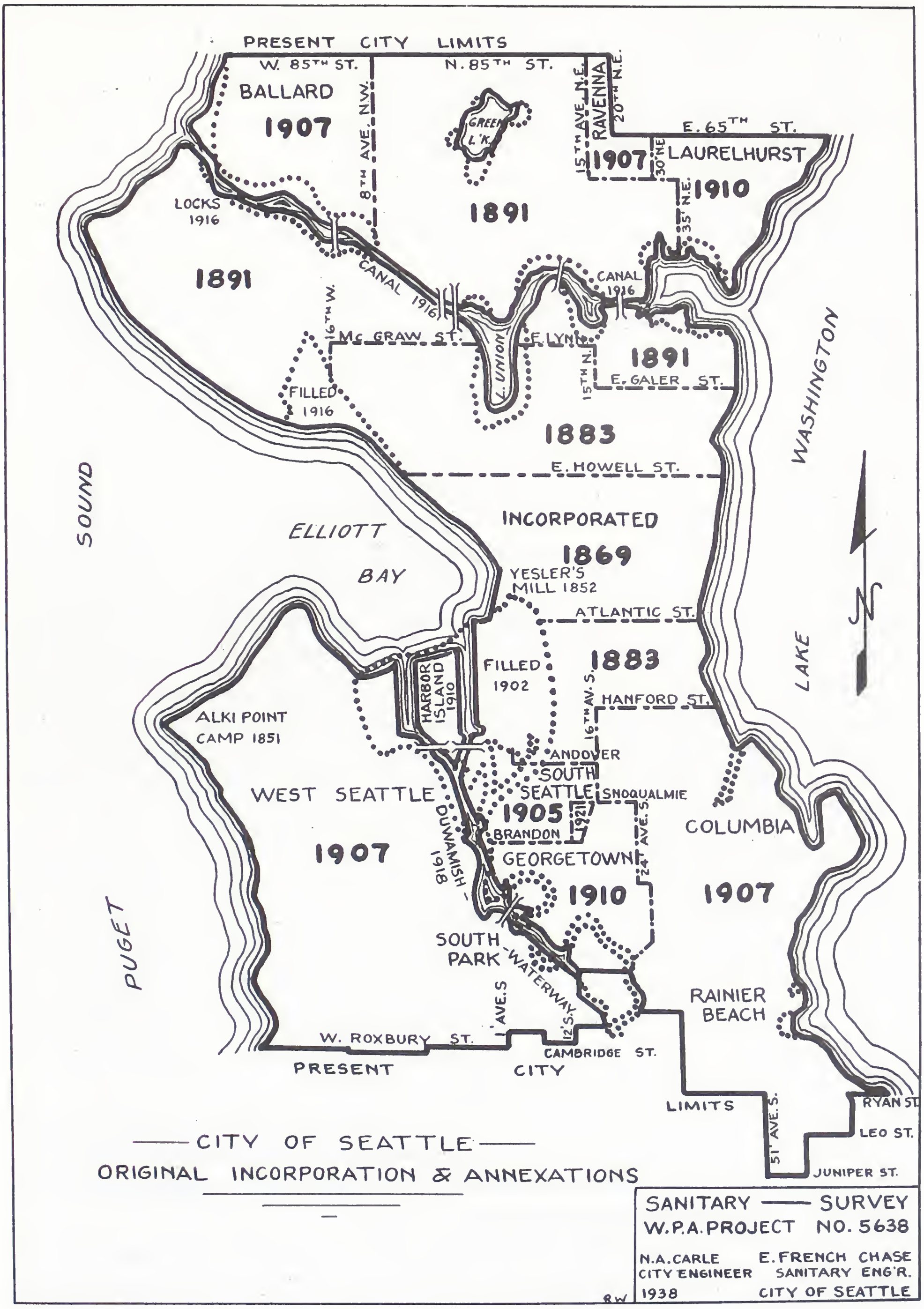
Annexation

THE City's first plat contained only one ward or political division for administrative and voting purposes. As the City grew in population the number of wards increased and it was agreed that eight wards would be the limit until a population of 240,000 was reached. Additional wards would be created for each 20,000 increase above this figure. Officials hoped to keep the population evenly divided in areas of comparable size. New territory could be added to the ward it joined or, if it adjoined two wards, it could be annexed to the one showing the smallest vote at the last election. If the population of the area to be annexed was large enough, it could be made into a new and separate ward by ordinance of the City Council.

During the time the City was operating under the ward system, the annexation ordinances indicated which wards would be affected by the annexed property, who the judges and inspectors for the election were to be, the time the polls were to open, and the property description. These were nearly all emergency ordinances under an act approved by the Governor in 1890, and the annexation was therefore effective on the same day as the ordinances.

Many large annexations were made before 1910, but few were thereafter made until the late 1940s, and these were generally smaller except for the three large annexations made in 1953–1954. During the years following the first great wave of territorial expansions, the City was busy consolidating the services and improvements necessary in the new areas.

Eight of the large areas annexed before 1910 had originally been incorporated towns:



Seattle Original Incorporation and Annexations to 1921

Town of South Park—fourth class—became 12th Ward
Town of South Seattle—fourth class—became 1st Ward
Town of Southeast Seattle—third class—became 12th Ward
Town of Ravenna—fourth class—became 10th Ward
City of Columbia—third class—became 12th Ward
City of Ballard—third class—became 13th Ward
City of West Seattle—third class—became 14th Ward
City of Georgetown—third class—became 14th Ward

The first and most commonly used method of annexation was a petition describing the area to be annexed. It had to be contiguous to the City. The petition had to contain valid signatures of at least 20 per cent of the electors who had voted in the last general election in the area, and incorporated a request that an election be held. This petition was then filed with the City Council of the annexing city. If the Council approved the election, the petition was filed with the County Commissioners, who then checked the validity of the signatures. If enough of them were valid, a hearing was held and an election followed. If the majority of the voters in the election favored the annexation, the voting record was filed with the City Council, which could accept or reject the annexation. As the problems contingent upon an annexation had usually been resolved by this time, acceptance of the annexation petition was considered to be a matter of course. The principal functions of an annexation ordinance were to establish the City's jurisdiction, the date of annexation and the consummation of the procedure for the record. The record shows that no City Council ever refused to accept an annexation after a favorable vote of the people.

The second method of annexation required that a petition describing the area to be annexed and containing a map of the area, be addressed to the City Council. This area, likewise, had to be contiguous to the City and the petition had to contain the signatures of owners of real estate amounting to 75% of the assessed valuation for taxation purposes. Assuming the petition to be sufficient and the signatures valid, a public hearing was held and the Council then had the ordinance written. This method was used only when the property area was small.

In both methods the petition had to originate with the people in the area wishing the annexation. In the first method, the procedure was referred to the residents in the area for final action by voting, thus making it both an initiative and a referendum measure.

Between 1910 and 1950, department familiarity with annexation procedures dwindled to a minimum and many changes appeared in the municipality. In September 1952, about the time when a large annexation in the north end was being considered, the City Council delegated the City Engineer to make a study of annexation procedures and problems in other cities.

Anticipation of the many problems involved in the large annexations, because of their known low degree of development, relatively dense population and numbers of functional districts was, in a way, responsible for this study. The report formulated the basic problem in its introductory statement:

> "The annexation of the fringe areas surrounding a metropolitan city is probably the most serious and difficult problem confronting municipal officials today. It even supersedes that of traffic congestion in importance, for traffic from said areas is largely responsible for congested city arterials and parking areas. No real solution can be found without first determining whether the fringe area should be annexed and permitted to assist in financing some of these improvements of mutual benefit, or allowed to remain outside. . . ."

Among other difficulties, the suburbs frequently had to pay a higher levy to provide for their schools; this was reduced considerably when they were admitted to the City. In many cases they were not required to assume their share of already established indebtedness of the City even though that debt paid for the services they were getting after being annexed. Their taxes usually dropped while those of the residents of the older City remained the same.

Fair and equitable ways to carry out annexation were studied intensively during this period. A Legislative Interim Committee was appointed to seek information from other sections in the state. This Committee created the Annexation Review Board consisting of the Mayor of the City initiating the annexation resolution, the Chairman of the Board of County Commissioners of the interested County, the Director of the State Department of Commerce and Economic Development, and the Chairmen of the various school boards in the district, or alternates for any of these, and one resident of and property owner in the area to be annexed, chosen by a majority of the other members. No other representatives of City government were appointed to these bodies.

Many of the suburban districts are blanketed with what amounts to several continuing local improvement districts: one for fire protection, one for water, one for lights, one for paving. Sometimes one district may have several of these utility districts to supply its services. (Local newspaper articles make frequent reference to water, fire or sewer districts.) In later annexations fire protection and transportation have been the most sought advantages. Being expensive to supply, they are often left at the bottom of the list of requirements. In the case of the City, such improvements can often be included in an overall project of a larger area where the size of the improvement helps to cut down the per capita cost. The combining of the improvements into one contract usually greatly lessens the cost of administration and permits economies resulting from quantity purchasing.

In most instances the City favors annexation of industrial areas because they help to broaden the tax base and bring in more revenue, while residential areas are primarily an expense because of the services they need, either initially or to bring the area up to City standards.

Annexation has become a serious problem in municipalities of 50,000 or more population. The suburbanites like what they consider the quiet life and the unhurried pace of the residential section, though they frequently find it necessary to support separate and special districts for fire protection, water, libraries, lights, paving, sidewalks and other requirements; many times they have to settle for septic tanks to care for the sewer problem. Special assessments are often found to add up to more than the regular annual tax of the less desirable "big city" in which they work. During recent years, however, many suburbanites have been willing to pay this price for the privilege of suburban living.

Many Seattle officials believe that growth of fringe areas has been encouraged by the selling of municipal water and power to them even though at premium rates. But if and when the City refuses to make it easy for suburbs to secure water from the City lines, or to contract for other City services, the suburbs soon petition for annexation. When they elect to purchase utilities and services, premium rates from the cities create little incentive for annexation.

Suburbs present other disadvantages to urban areas. The City must spend large sums of money to accommodate traffic from the suburbs if it is to continue to keep its industries and businesses supplied with labor and customers. The trek away from the City often includes many of the ablest citizens; this strips the City of much needed leadership at the same time that it adds to its traffic burden.

The Greenwood annexation of 1953–4 included all of Sewer District No. 3 in Blue Ridge, all of Sewer District No. 4 in North Beach, all of Sewer District No. 5 in Greenwood and approximately 60% of Sewer District No. 6 in Lake City. It also involved fire and water districts and a substantial portion of School District No. 412, Shoreline.

Except for the School District, which was not a particular concern of the City, the integration of these districts or portions thereof with the City was provided for by Chapter 248, Laws of 1951. The sewers were the direct concern of the Engineering Department, but similar problems confronted the Water and Fire Departments in taking over the water and fire districts annexed. This was the first annexation which placed upon the City the responsibility of taking over utility districts in their entirety and many unusual problems resulted.

The City became the owner of all the property and assets of several districts with full power to manage and control, maintain and operate their facilities, and to fix and collect charges to customers subject to any outstanding indebtedness which the City elected to assume.

A utility district is, in effect, a local improvement district, except that it has the power to operate and maintain the facilities constructed and the authority to regulate their use. It is a means provided by the Legislature to supply essential services in rural areas where local improvement statutes or County responsibility are not adequate. On this basis it was supposed that the City would not assume the responsibility for the debt of any such district any more than it would for a local improvement district created for the construction of sewers. The City did have the responsibility of collecting local improvement assessments in the North Beach Sewer District and monthly service charges in the Greenwood Avenue Sewer District, which were security for the sewer revenue bonds issued to finance the improvements.

The Greenwood district included a service charge in its assessment to operate and maintain its system. North Beach had no service charge but collected $9.00 per year to cover such costs. The City relieved them of this charge as they paid in their general City tax levy for sewer maintenance and the same sewerage charges as the rest of the City when it became effective. The maintenance fund paid the operating cost of two treatment plants and the salaries of the managers and employees. The City Treasurer and Comptroller took over the collecting and accounting functions.

The electors in the north end area were overwhelmingly in favor of annexation to the City, principally to shift the operation of the various districts to the City. There were a number of legal questions to be worked out by the attorneys of the districts and City officials, and the annexation was accomplished in accordance with agreements reached between the Commissioners of each district and their attorneys, the Corporation Counsel, the State Examiner, and various other City and County officials.

The Lake City Sewer District presented several problems because it was in the process of constructing its own sewer system, about one-third of it being still outside the City limits. Until the end of 1953, the City operated under an agreement whereby the district constructed, maintained and financed its system and the City controlled the use and repair of the public streets. The District could not get approval of additional bond issues; this slowed construction, and generated agitation for the City to assume responsibility for the entire district. This was not legally possible, but the City did assume the maintenance of all the facilities. The monthly service charge had been increased to $3.00 to cover the bond refunding as well as the METRO sewer service charges borne by the entire City.

As the local financial problems of the several districts culminated, the physical properties were transferred to the City and the districts joined the group of incorporated areas as customers of the METRO Sewerage System.

AREA GROWTH OF THE CITY SEATTLE

District	Ordinance	Effective Dates		Area	
WASHINGTON—A TERRITORY	Number	Ord. Appr. —	Annexed	Sq. Mi.	Total
1—Area of first incorporation			12–2–69		10.86
2—Area after Charter Amendment of			11–12–75		5.08
3—Area after Charter Amendment of			11–28–83		12.65
4—Area after Charter Amendment of			2–4–86		12.67
WASHINGTON—A STATE, November 11, 1889					
5—North Seattle Annexation	1695	4–3–91	5–3–91	16.94	29.61
6—Seattle Tide Lands Plat Filed			3–15–95	4.63	34.24
7—South Seattle Annexed	12898	10–20–05	10–20–05	0.85	35.09
8—Southeast Seattle	15172	1–7–07	1–7–07	5.73	40.82
9—Ravenna	15228	1–15–07	1–15–07	0.62	41.44
10—South Park	15917	5–3–07	5–3–07	0.87	42.31
11—Columbia	15918	5–3–07	5–3–07	1.12	43.43
12—Ballard	16083	5–29–07	5–29–07	3.71	47.14
13—West Seattle	16558	7–24–07	7–24–07	16.34	63.48
14—Rainier Beach	16909	9–12–07	9–12–07	3.62	67.10
15—Georgetown	23814	4–11–10	4–11–10	1.96	69.06
16—Laurelhurst	25791	11–30–10	12–30–10	2.32	71.38
17—Area surrounded by City in Sec. 20, T 24 N, R 4 E, WM	*Admitted by State Laws of 1921*			0.09	71.47
18—Golden Gardens Park-County Portion	70142 amended by 70477	9–20–40 12–17–40	9–20–40 12–17–40	0.1333	71.6033
19—Haynes Park District in Sonora Precinct	71253	9–10–41	10–10–41	0.0223	71.6256
20—A portion of Sandpoint Precinct	71857	4–29–42	5–29–42	0.3124	71.9380
21—Portions of Buchanan and Yarbo Precincts	72266	11–10–42	12–10–42	0.1514	72.0894
22—A Portion of Ziria Precinct	72412	2–10–43	3–12–43	0.0634	72.1538
23—A Portion of Sonora Precinct, et al	73879	3–20–45	4–19–45	1.2310	73.3838
24—A Portion of Maple Leaf No. 1 Precinct, et al	73880	3–20–45	4–19–45	0.1313	73.5151
25—Lake Ridge Div. No. 3 and No. 4 Additions, et al	74432 amended by 74602	11–28–45 2–22–46	12–31–45	0.1082	73.6233
26—A Portion of the NE ¼ Sec. 1, T 23 N, R 3 E, WM	74757	3–6–46	4–8–46	0.0057	73.6290
27—Lake Ridge Park	76422	10–30–47	11–29–47	0.0483	73.6773
28—A Portion of Maple Leaf No. 1 Precinct	76962	4–28–48	1–1–49	0.0518	73.7291
29—A Portion of the NE ¼ Sec. 1, T 23 N, R 3 E, WM	77429	10–20–48	1–1–49	0.0062	73.7353
30—A Portion of the SW ¼ Sec. 32, T 26 N, R 4 E, WM	78749	2–28–50	3–30–50	0.0947	73.8300
31—A Portion of the S ½, Sec. 31, T 26 N, R 4 E, WM	78825	4–1–50	5–1–50	0.1891	74.0191
32—A Portion of Assessor's Plat of Endolyne	79226	8–22–50	1–1–51	0.0041	74.0232
33—Lots 151, Blk. 16, C. D. Hillman's Meadow Gardens Addition, Div. No. 2	79227	8–22–50	1–1–51	0.0015	74.0247
34—A Portion of the SW ¼ Sec. 33, T 26 N, R 4 E, WM	79228	8–22–50	1–1–51	0.0641	74.0888
35—A Portion of the SW ¼ Sec. 35, T 26 N, R 3 E, WM	80359	10–4–51	1–1–52	0.0434	74.1322
36—Northgate Dist. in Secs. 29 & 32, T 26 N, R 4 E, WM	81186	7–21–52	8–20–52	0.8545	74.9867
37—Sand Point Dist. in T 25 N, and T 26 N, R 4 E, WM	81655	1–13–53	3–1–53	4.4030	79.3897
38—Pinehurst Dist. in Sec. 29, T 26 N, R 4 E, WM	81704	2–3–53	3–1–53	0.3792	79.7689

AREA GROWTH OF THE CITY SEATTLE (*Continued*)

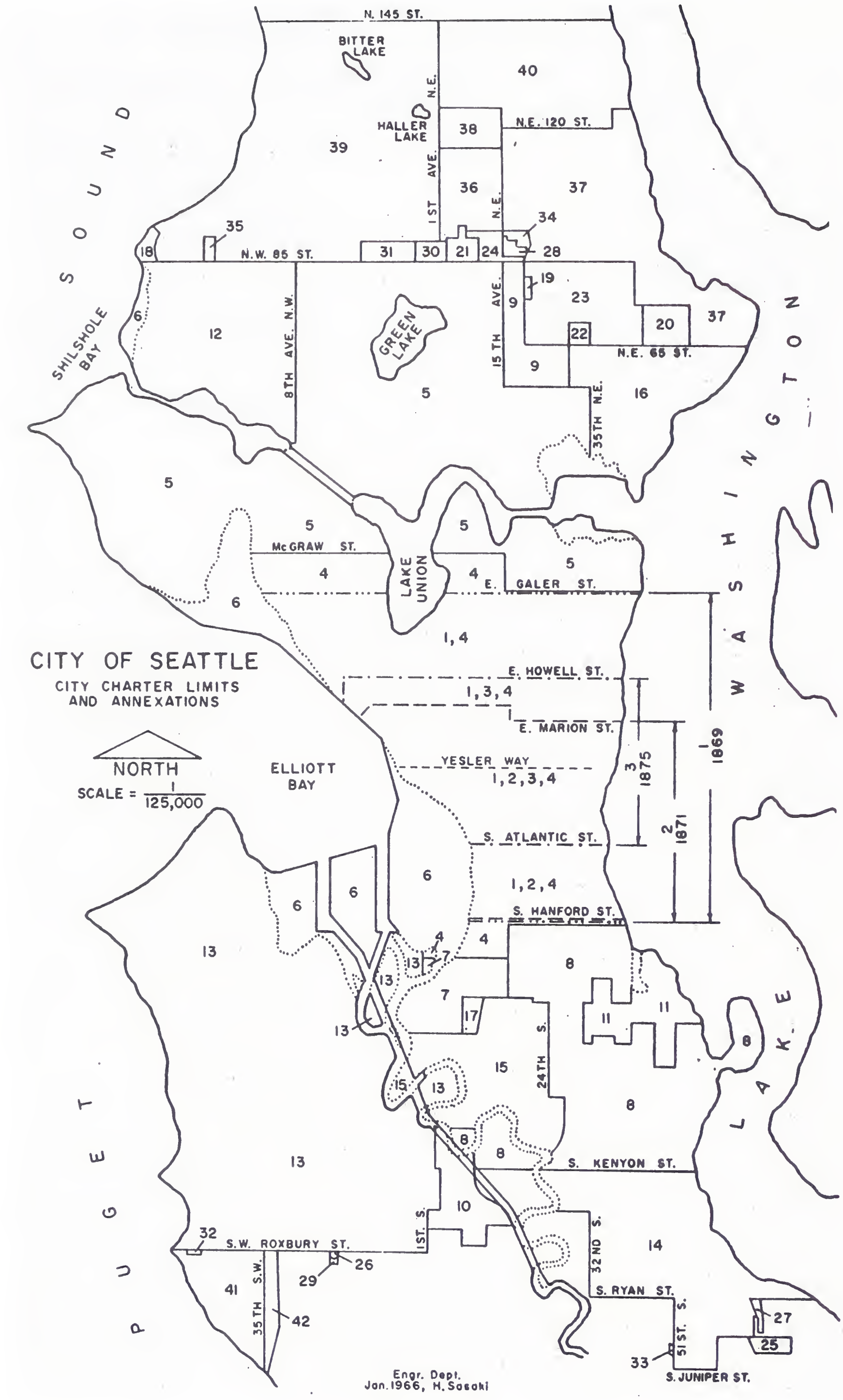
District *WASHINGTON—A TERRITORY*	Ordinance Number	Effective Dates		Area	
		Ord. Appr.	— Annexed	Sq. Mi.	Total
39—Greenwood Dist. in T 26 N, R 3 & 4 E, WM	82425	11–2–53	1–4–54	7.8741	87.6430
40—Lake City Dist. in T 26 N, R 4 E, WM	82426	11–2–53	1–4–54	2.5945	90.2375
41—Arbor Heights in Secs. 2, 3, & 11, T 23 N, R 3 E, WM	83228	7–19–54	9–1–54	1.0216	91.2591
42—Roxbury Heights in Secs. 1 & 12, T 23 N, R 3 E, WM	84568	10–31–55	1–1–56	0.3094	91.5685

NOTE: Above area includes all water areas between the north and south City Limits from the Pierhead Line on Puget Sound to the Pierhead Line on Lake Washington. Annexed water areas outside these lines are not included.

Within the above area the waters of Salmon Bay, Lake Washington Canal, Lake Union, Green Lake, Bitter Lake, Haller Lake, East Waterway, West Waterway, and Duwamish Waterway comprise in

Sq. Miles: Water Area— 3.0688
Land Area —88.4997
Total Area —91.5685 Sq. Mi.

Compiled in the office of the City Engineer
under the direction of /s/ *James W. Chase*, Mapping Supervisor



Seattle Annexations to 1975

CHAPTER 16

Street Names and House Numbering

EARLY streets in Seattle had been named in memory of pioneers, presidents, states or cities, and the names had been given as the various platters wished. Names recurred in different plats. The older maps and plans give the impression that there was no definite method, though avenues seem to have been roadways of a boulevard type. Streets were named on north-south courses as well as east and west.

On January 14, 1865, the Territorial Legislature had passed an act incorporating the Town of Seattle, and had drawn up a Town Charter, placing governmental power in the hands of five elected trustees. The town limits thus established were Howell Street to the north, Atlantic Street to the south, and 24th Avenue South and Elliott Bay to the east and west, respectively. But the citizens soon became dissatisfied with the provisions of the original Charter and petitioned for disincorporation, which was granted by the Legislature on June 18, 1867; the erstwhile town reverting to being once again a precinct of King County, after slightly more than two years of existence as a municipality. Late in 1869, having had another change of heart, the citizens of the precinct petitioned the legislature to grant them another municipal government, "this time a more pretentious one," in the words of historian Clarence Bagley. The population of the settlement had increased from 400 to 950 in the intervening years, and the problems of governing and policing it had grown in proportion. The Legislature accordingly granted the request, and on December 2, 1869 Seattle re-incorporated as a city, the new boundaries of which consisted of Galer Street to the north, Hanford Street to the south, and Elliott Bay and Lake Washington to the west and east. The next few years witnessed, oddly enough, several shrinkings of the original boundaries; to Denny Way west of 15th Avenue North and Mercer Street east of that point in 1871, and in 1875, from Hanford Street north to Atlantic Street. Geographical expansion from these reduced boundaries did not resume until 1883. Most of the settlers, meanwhile, established themselves in the space around the southerly portion of Elliott Bay, and easterly of it.

There were enough streets and houses in Seattle in 1883 to make house numbering worthwhile. Ordinance No. 394, June 5, 1883, established the initial points on Yesler Way at First Avenue and at Broadway from which to begin numbering, and the plan has been substantially continued through the years. Twenty feet of frontage is allowed to each house number and a block is allotted numbers ascending at intervals of 100 from one block to the next, unless it is unusually short. Even-numbered houses are on the east side of avenues and on the north side of streets; odd-numbered houses are on the west and south side of avenues and streets respectively.

Naming of streets has been a problem from the very beginning. In 1887 Ordinance 882 amended the original house numbering system and changed street names. Mill Street became Yesler Way; Commerical Street from the south City Limits to Yesler Way followed the same course as the present day First Avenue South; Depot Street was renamed Denny Way; Temperance Street became Queen Anne Avenue. The intersection of Mill Street and Broadway was established as an initial point for all north-south streets between Mill Street and Depot Street. The initial point for east-west streets lying between Depot Street and Mill Street was Front Street (First Avenue) . For all streets south of Mill Street, extending in a northerly-southerly course, the initial point was Mill Street; and the ordinance further provided that those which were "designated, named and known by ordinal numbers (First, Second, etc.) shall hereafter have the word 'South' as a prefix to their names, and shall hereafter be designated and known by their present names with the addition of the said prefix 'South.' "

Front Street was the original name of 1st Avenue, as far south as Yesler Way; Commercial Street was the original name of 1st Avenue South. (i.e., south of Yesler) . Prior to the 1889 fire, the jog that now exists halfway between Yesler and James Street did not exist and 1st Avenue and 1st Avenue South did not form a continuous thoroughfare.

For all streets north of Depot Street, extending in a northerly-southerly course, the initial point was Depot Street, and for streets extending easterly and westerly north of Depot Street, the initial point was Temperance Street. This set up a street numbering system that extended both north and south from Yesler Way, and began over again at Denny Way.

Another provision of Ordinance 882 recognized the developing need of compass directions. As a beginning it established "That all streets south of Mill Street which are now . . . known by ordinal numbers, shall hereafter

. . . be known by their present names with the addition of the said prefix 'South.'" The ordinance also established that "All streets crossing Front, Temperance and Commercial Streets in an easterly and westerly course shall hereafter have the word 'West' as a prefix to their names for the portions of such street west of said Front Street, Temperance and Commercial Streets, and such portions of such streets shall hereafter be designated and known by their present names with the addition of said prefix 'West.'" This established the streets west of Queen Anne Avenue as West Streets.

A letter dated October 21, 1926, addressed to the Board of Public Works and signed by the Street Naming Committee, gives information concerning the street naming policy which was followed until 1961, and is quoted here *in extenso:*

"In 1895 the City of Seattle passed certain ordinances fixing how street naming should be done. These ordinances are Nos. 4044, approved December 23, 1895, 6864 and 6865.[1] The gist of these ordinances provides the following: An attempt was made for the conventional system, with axes at right angles to each other, intersecting near the center of the City of Seattle, but in the Central District (the business part of the city) bounded on the north by Denny Way, on the south by Yesler Way, on the east by Broadway and Melrose Avenue and on the west by Elliott Bay, the streets bearing about north 45° west instead of due north defeated the possibility of this system, so that, starting at First Avenue and Yesler Way and going northerly over First Avenue through the Central District we arrive at a point 15 blocks west of the north and south meridian through First Avenue South. The streets in the Central District numbering from First to Ninth Avenue were taken as the control and an effort was made to match them at their southerly end at Yesler Way and at their northerly ends on Denny Way, with existing north and south streets, but the slant distance on Yesler Way and Denny Way being greater than the square distance of the rectangular platting north and south of the Central District, the streets did not match and there were introduced at the northern part of the town Warren Avenue, Nob Hill Avenue, Taylor Avenue, Dexter Avenue and other streets that have no corresponding streets through the southerly district. It will also be noted that 9th Avenue North at Denny Way, is 15 blocks west of 9th Avenue south of Yesler Way, and that 9th Avenue south of Yesler Way is continuous with Broadway, the reason for calling it Broad*way* being that the boundaries of the Central District from which street numbering should start were to be called "Ways."

"Beginning with First Avenue and Yesler Way, all avenues south of Yesler Way are consecutively numbered going east, and beginning with

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[1] The letter writer was not precise in giving the dates of these ordinances; 6864 and 6865 were approved May 8, 1901.

10th Avenue (the first continuous north and south avenue east of Broadway) the avenues north of Yesler Way as far as the lakes are consecutively numbered going east, with the exception of some irregular blocks.

"In the area west of Broadway and east of 9th Avenue south of the lakes, there is a gore or zone of 15 blocks of offset before mentioned, and the avenues in it are for the most part named after pioneers.

"Coming back to Denny Way and First Avenue and going one block west on Denny Way, we come to Queen Anne Avenue. This being the east boundary of the West District, should be a "Way" instead of an "Avenue." All avenues west of Queen Anne Avenue and Queen Anne Avenue produced are numbered consecutively as near as may be, taking into account the irregular platting.

"In the zone between First Avenue Northeast and First Avenue Northwest, north of the lakes, avenues are named.

"In the area bounded on the north by Denny Way, on the south by Yesler Way, on the east by Lake Washington and on the west by Broadway and Melrose Avenue, the east and west streets are again subject to the control of the streets in the Central District, and in consequence there is a zone or gore that makes the numbering irregular.

"As set forth in the ordinances, the following seems to be required, viz: that streets east and west, and avenues north and south, as far as practicable, should be numbered. Notwithstanding the fact that many departures have been made from this ordinance plan, we doubt the wisdom of continuing such departures.

"The question of street naming and numbering has been referred to the City Planning Commission by the City Council and a totally different system of naming and numbering may ultimately be developed."

Ordinance 6865, approved May 8, 1901, mentioned in the beginning of the above quoted letter, spells out a system for house numbering in relation to the street numbering.

When a new area was annexed to the City the names of the streets and avenues were changed to conform to those existing in Seattle at that time. Thus when the portion south of W. Roxbury Street and west of 32nd Ave. SW was annexed in 1953–5, the old county street designations, which included such fetching appelations as "Ora Street," "Helena Street," "Greenwood Street" and "Sunnywood Street" were unceremoniously dumped, prosaic number designations replacing them; but the gain in orientation probably offset the loss of euphony.[2]

Prior to 1887, no compass directions had been included in street names in Seattle. The prefix and suffix system for streets and avenues in Seattle was established by specific renaming in the early street naming ordinances. As the settlement grew certain changes were required and the old ordinances were repealed and amended as necessary to meet the changing circumstances.

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[2] Report by Ward Terpening to E. W. Embury, 1–16–30. Some of these earlier street designations had already been dropped by King County but they persisted into the City.

One major problem remained to be worked out, however. Many of the early plats were laid out without benefit of formal survey, and as they were not contiguous in many cases, streets, when planned at all, were frequently not continuous thoroughfares; moreover, the donation claims laid out in various areas of the city were often not measured along subsequently established survey lines. Each platter was free to name his streets according to his fancy and there are many instances where the same street was known by several different names depending upon the particular plat in which it lay. Eventually these names were changed so that the street had a single name for its entire length but platting discrepancies continued to create problems for surveying, assessing and taxation.

Ordinance 4044, approved December 23, 1895, was designed to correct this situation. Its first provision was "That Yesler Avenue throughout its whole length from Elliott Bay to Lake Washington, be and the same is hereby changed to Yesler Way." Signed by the President of the Board of Aldermen and the President of the House of Delegates on December 16, 1895 and by the Mayor on the 23rd,[3] Ordinance No. 4044 contained 30 other sections and the names established by it have largely persisted through the years. One of the numerous consolidations of street nomenclature which it effected was the combining of Union Street into one thoroughfare; prior to its passage this had (according to the Polk City Map of 1894) been designated as Union Street, Cooper Street, Division Street, Alta Street, Division Street again and finally Union Street as it progressed eastwardly to Lake Washington.

In 1901 the streets north of Lake Union, Salmon Bay and the route of the Lake Washington Ship Canal were due for alteration, defining and establishing of names. Ordinance No. 6864, which went into effect in May 1901, has only five sections, but lists 72 streets in one section and 65 in another. It makes first mention of the northwest suffix for avenues following a northerly-southerly direction:

"Lombard Street, Spruce Street, Chicago Avenue, Cedar Street, Chicago Avenue, Baxter Avenue, Lock Street and Canal Avenue, to be First Avenue Northwest." (Chicago Avenue was named twice because it was separate sections of the same street.)

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[3] The 1890 City Charter established a bicameral council, consisting of a Board of Aldermen and a House of Delegates; the 1896 Charter abolished this cumbersome arrangement in favor of a unicameral council.

"Tiney Street, Clinton Street, Harmon Court, Malson Street, Clinton Street, Kittinger Avenue and Lake View Street, . . . Second Avenue Northwest."

Palatine, Phinney, Greenwood, Dayton, Burke, Meridian, Sunnyside, and all the others then in use and platted between First Avenue Northwest and First Avenue Northeast, were named with no compass direction, and thus continued the corridor north from Lake Union that had been tacitly established by Ordinance 882. The avenues out to Twenty-seventh Avenue Northeast and their related Places and Ways were named.

Section 2 ordained that the numbered roadways north of Lake Union, running generally east and west between First Avenue Northwest and First Avenue Northeast should have the prefix "North." All portions of numbered roadways lying west of First Avenue Northwest were given the prefix "West" and all portions lying east of First Avenue Northeast were designated "East."

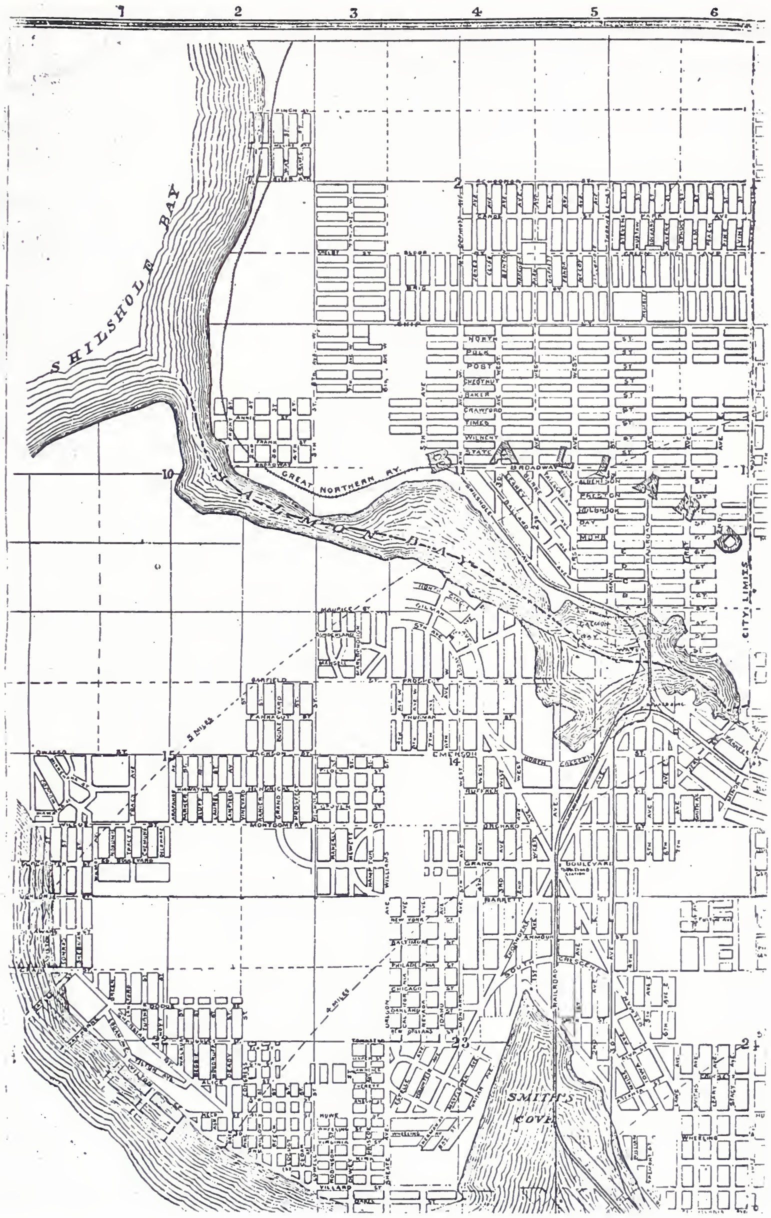
Lake Avenue, Spokane Street and such other streets or places which formed the connected avenue along the north shore of Lake Union east of Ewing Avenue were all lumped together and officially designated as "Northlake Avenue."

Green Lake Boulevard from the intersection of Woodland and Wallingford Avenues, around the east shore of Green Lake to the west line of Levinson's Addition, was renamed East Green Lake Boulevard and between the same limits around the west shore of Green Lake, including the avenue named Lake Avenue, it was redesignated as Green Lake Boulevard.

The 1895 and 1901 ordinances established the basic plan of our modified grid system for the naming of city streets. Each annexation presented a new problem and a tangle of streets to fit into the basic plan. Duplicate street names were eliminated and many names for a street were combined into one name. Some of the ordinances were obliged to rename practically all of the streets in the area covered by them in order to achieve a measure of conformity.

Ordinance 16791 in August 1907 renamed the streets in the Town of Ravenna, annexed to Seattle earlier that year. Ordinance 16363, June 24, 1907, did the same for the streets formerly in the City of Ballard. Market Street in Ballard had formerly been made up of "That Broadway in Gilman Park, H. W. Treat's 1st., Brygger's 1st Home and Brygger's 2nd Home Additions, and as condemned through the Creosote Tract and the Farmdale Homestead Tract No. 49; and in Gilman Park Addition, subsequently East Broadway."

Ordinance 17213, October 1907, had the task of altering, defining and establishing the names of streets, avenues, ways and places as platted or existing in portions of the City lying within the City of Columbia, town of South Park and the city of Southeast Seattle. Many of the streets of our



Ballard and Magnolia Street Names Prior to 1907 Annexation

business and commercial area were established by this ordinance. "South" became the suffix for those numbered streets extending south from Mill Street, as had been established by Ordinance No. 882.

The Boulevard along the west margin of Plat of Wildwood became Rainier Avenue; The Cedar River Pipe Line Right of Way became Beacon Avenue; South Fourth Street in Aberfeldy Estate Addition became Second

Avenue South; South Fifth Street in Aberfeldy Estate Addition became Third Avenue South; and South Sixth Street in Aberfeldy Estate Addition became Fourth Avenue South. It will be recalled that these streets continued across several additions or plats; and that each original platter had named the portion of street lying within his plat according to his own fancy and without regard for the names already given to portions of the same streets lying within contiguous plats. Ordinance 17213 rectified this situation by giving uniform names to all continuous streets. Other anomalies such as east-west thoroughfares that had originally been designated as Avenues rather than streets (e.g., Austin Avenue) presented somewhat less difficulty.

The street naming pattern for West Seattle was established by Ordinance No. 17214, approved October 23, 1907, after West Seattle was annexed by Ordinance No. 16558, approved July 24, 1907. Ordinance No. 17214 indicated that numbered avenues were to have the suffix "Southwest," named avenues were to have neither prefix nor suffix, and named streets were to have the prefix "West."

By Resolution No. 730, February 16, 1921, the County changed its named streets in the north end to numbered streets, and in the south portions of the County the named streets were given new names with a west prefix in the area west of First Avenue South. No prefix was used in the south area.

County Resolution No. 3709, June 17, 1930, adopted a new street designation system in the south and southwest portions of the County, laying out a grid pattern with numbered avenues and numbered streets. The areas west of First Avenue South used "Southwest" named streets and numbered avenues "Southwest."

East of First Avenue South there were "South" numbered streets and numbered avenues "South." A guide map was included in the resolution. An example of the change is given in the Arbor Heights area where West Norfolk Street was changed to Southwest 100th Street.

The earliest detailed street map that is still available in 1967 was prepared by the City Engineering Department, signed by I. M. Smith, dated April 1934. It shows the system of street designations that had been established up to that time. For no readily evident reason, all the west streets from the north to the south City Limits were designated as "West," rather than by compass designation.

The first porcelain enamel-on-metal street name signs, with white letters on blue background, appeared in the Central Business District in about 1922. Wooden signs of the same color predominated throughout the City until about 1952. Most of them were attached to wood posts or to existing utility poles and many were missing entirely by the 1940s; others had become unreadable.

Signs installed in the 1940s were black-on-white porcelain enamel on steel blades and were very brittle. The enamel often shattered when the bolts that held the signs in place were tightened. Consequently they rusted and deteriorated much sooner than they should have. Five thousand street name signs were placed in the area between Aurora Avenue and the east City limits north of the Canal and in the Magnolia District in 1949, and over six thousand existing signs were refurbished and replaced.

In 1950 the Mayor and the Council asked the City Engineer to make a study in preparation for city-wide program to replace all the street name signs. As a result of the study, appropriations amounting to $398,000 were set aside by Ordinances Nos. 80225, 81048 and 82777, the last amendment being approved February 24, 1954. Specifications were prepared for three contracts covering the Central Business District, the Arterial Streets and the Residential Districts. The first of the new signs were installed in 1952, and all three contracts were completed by the 16th of December, 1953. The new signs were porcelainized enamel on metal, black-on-white, the plates seven inches wide in contrast to the old 5½ inch plates. They were mounted on 2½ inch steel posts or on bronze brackets attached to the ornamental light standards. In appearance and readability they were a great improvement over the old signs.

Between 1952 and 1954 a series of annexations moved the City limits north from 85th Street to 145th Street and this area required the installation of new street name signs. These signs were all black-on-white, wooden signs on wood posts.

Street names and street name changes are processed through the Street Naming Committee of the Board of Public Works, the chairman of which was the Superintendent of the Building Department. As the opening of the 1962 Century 21 exhibition approached, the criticism that about half the street names did not sufficiently indicate areas such as northeast, northwest, southeast and southwest, and that the existing system of geographical designation was somewhat confusing, especially to newcomers, became increasingly relevant. Consequently, in 1958 a special Street Naming Committee was formed to consider the accumulated requests for changes in street names and numbers and to make the necessary changes to give all the signs in the City appropriate compass designation in time for the Fair. This special committee consisted of representatives from the Post Office, the Police, Fire and Engineering Departments, the Transit and City Planning Commissions, and the Building Department; the Telephone Co. and local Automobile Association were also represented. The Chairman of the Committee was from the Building Department, which has the task of allotting house numbers in accordance with the ordinances.

During 1959 various solutions for the City's system of stree name designations had been submitted by interested parties. The perfect quad grid plan was one of these (northwest, northeast, southwest and southeast). The Committee's goal was to create, with the least total disruption to the activities of the City, an improved plan that would come closest to an ideal grid system, and which would most readily identify each thoroughfare as to its geographical location within the City. It was ultimately determined that the best solution was to improve the prefix-suffix system within the existing district boundaries without disturbing the house numbering system. This meant that none of the prefix-suffix boundaries would be changed, except for the boundary of one small area resulting from moving the south and southwest line from First Avenue South to the East Waterway and Duwamish Waterway west of First Avenue South. It was believed that Seattle was too large to change large segments of the house numbering system, and that such a change would cause confusion. In order to conform to the existing County system between First Avenue South and 100th Avenue South (in Renton), the south district in Seattle was not changed to southeast. Mercer Island and the area east of 100th Avenue South (in Renton) has the "Southeast" prefix and suffix plan.

Ordinance No. 89910, approved April 1, 1961, established the present street naming plan, setting up an improved prefix-suffix compass designation system, and stipulating that all roadways of east-west or north-south address numbering system should have a prefix or suffix, respectively, of the appropriate compass direction, with the exception of the downtown area, where no prefixes or suffixes were employed. The only other exceptions provided were the area between Eastlake Avenue East and Queen Anne Avenue North and north from Denny Way to the Ship Canal, where the streets have no prefix, and the area between Yesler Way and Denny Way from approximately Broadway to Lake Washington, where the avenues have no suffix. To portray this new system in the ordinance, a map of the new street name designation system was included. This provides sufficient information to determine proper prefix-suffix designations for the grid patterned, right-angled streets and avenues. A list providing the correct prefix or suffix, according to the house numbers, for the roadways that angle across the grid pattern where the choice between prefix and suffix could be difficult (as in the case of Ways, Places, Boulevards, Courts and Drives) was included.

Also in Ordinance 89910 was a change suggested to the Committee by the Fire Department, whereby the thoroughfare around Green Lake on the north side of the Lake became Green Lake Drive with the appropriate "East" or "West" prefix and the "North" suffix. On the south side of the Lake it was designated as Green Lake Way with the appropriate prefix and the "North" suffix. This change eliminated the confusing situation in which two or more intersections might have identical designations.

There were no "Southwest" streets until they were established by the

Street Naming Committee in Ordinance No. 89910. As there had been no policy changes since 1907, the Committee took the opportunity to eliminate the confusing situation which gave the direction "west" to all streets from the north to the south City Limits lying west of First Avenue North, Queen Anne Avenue and First Avenue South. These streets now have "Northwest," "West" and "Southwest" prefixes in accordance with their location on the westerly side of the City.

With this improved prefix-suffix system, a new street name sign program was initiated in 1962. The Traffic Engineering Division replaced all the black-on-white enamel street name signs with the new reflectorized silver-on-green, described by the trade as silver-on-green Scotch Lite. The faces are baked on to the aluminum blades under intense heat in a vacuum applicator. These signs, which were first used in the Arbor Heights annexation in the southwest portion of the City in 1958, have greatly enhanced the appearance of the streets, and have aided residents and visitors in finding the various addresses.

Seattle is one of the few cities in the country which uses seven-inch stock for street name signs. This size gives better readability than the normal six-inch blade commonly used. Both capital and lower case lettering are used in the new signs and this also adds to the readability.

The signs in the Central Business District and in the vicinity of the Fair Grounds were changed prior to the opening of the Fair in 1962. The remaining City-wide program, which included the area from Yesler Way to the south City Limits, was not completed until 1965. This street name sign program comprised changing only the name sign plates. The existing bronze brackets in the Central Business District were refurbished and the existing steel poles in the remainder of the City were reused. Approximately 60,000 new street name signs had been installed at the 12,600 intersections in the City at the close of the program in 1966.

CHAPTER 17

Surveying and Mapping

An act of Congress approved on September 27, 1850, gave every single white settler in the Territory of Oregon who was over eighteen years of age the right to 320 acres of land; if he were married, his wife also was entitled to 320 acres of land, the total of the two acreages being equal to an entire section. Under this provision only Luther M. Collins and wife and John Buckley and wife received the full section of land.

Those arriving in the territory between December 1, 1851 and December 1, 1853, received the right to 160 acres each for man and wife, or only half as much as was allowed to those coming before 1851. H. L. Yesler, C. D. Boren, A. A. Denny, Wm. N. Bell, D. T. Denny, John H. Nagle, Thomas Mercer, Henry A. Smith, J. J. Moss, Edward Hanford, John C. Holgate, Henry Van Asselt, and Eli B. Maple with their wives received 320 acres each, though it took many years to get the surveys established and the claims settled. While Dr. David S. Maynard arrived before 1850, he received only a half-section as it was decided that his divorced wife was not entitled to the land, nor was the second wife, to whom he was married after he reached Olympia, entitled to the half-section.

These are the names which appear on the early plats of the City and it was these same pioneers who laid out the first additions and streets.

From the Chronological History of Seattle by Thomas W. Prosch comes the information that by mutual agreement "the town of Seattle" was platted May 23, 1853 by A. A. Denny, C. D. Boren, and D. S. Maynard. The Maynard plat extended from the Southeast to Tenth Street, four blocks wide on the front from Yesler to King, and seven blocks wide in the rear, or on the east, and it included fifty-eight blocks. The combined plat of Boren and

Denny extended from Yesler Way to Spring Street and from First Avenue to Third and included twelve blocks. Boren's first individual or sole plat was filed in February 1854, and included thirty-two blocks. The first plats of other original townsite owners were those of W. N. Bell, August 1858, (A. A. Denny was associated with him in the tract) ; Edward Hanford, June 1869, D. T. Denny, July 1869; and Thomas Mercer, August 1870.

In the original Plat Books these land grants to the early settlers are designated as "Donation Claims." Most of the names are still on various plat maps of local property, though some areas have been replatted and no record of original ownerships remain. It took many years to perfect the titles.

Title to the Oregon Territory was established between Great Britain and the United States by the Webster-Ashburton Treaty in 1846. When traders and settlers began invading the country, the Government made plans for a survey and passed an authorizing act in September 1850. This survey was to lay out townships and sections according to the "Rectangular System of Land Survey." The first stake was driven on June 1, 1851 at what is now the intersection of the Willamette Meridian and the Base Line in the Portland, Oregon area. While the survey was progressing over the territory, the Donation Claims in Seattle and elsewhere were also being staked out. These claims had to be specially measured and did not always coincide with subsequently established survey lines and points. Rivers and lakes were not included in the survey and later required careful and special treatment.

The task of surveying the Oregon Territory in the 1850s and 1860s was a difficult one. The work was done under contract and paid for at a specified rate per mile for each mile of line run. Running survey lines over rough wooded terrain, using surveying equipment crude and inefficient in comparison with that of the present day, and faced with the need for speed in order to make a profit on the contract, it is not surprising that these pioneer surveyors made many errors.

The pioneers established their reference points for vertical control, which have become known as "Seattle Datum," by measuring the high tide levels for a given number of days, and taking the average. For horizontal control they drove a nail in the center of a hub and buried the hub slightly below the ground surface at the intersection of the centerlines of Commercial (1st Avenue South) and Main Street. At the intersection of the centerlines of Mill Street (Yesler Way) and Commercial Street there was a rough boulder in which they carved an "X." The account giving this information is dated 1875. Another record indicates that the points were established in 1873 at four different places, including these two. In either case, the points were minimal. The surveyors used a 66-foot link chain (known as a Gunter's chain) and lengths of rope which stretched. As D. T.

Denny, who made the first survey on November 3, 1860, explained, land was plentiful and the surveyors fully intended to make accurate measurements; but errors were inadvertently made and accumulated; and by the time the survey had progressed as far as Pike Street, buildings and other improvements stood nine or more feet in the street.

From these sketchy and sometimes inaccurate beginnings, the Seattle Engineering Department has, over the years, built a substantial survey network of horizontal and vertical control for the City.

In 1883, Ordinance 383 was passed establishing a vertical datum point to which the grades of the City were to be referred. This point was set just below the top of the granite step in the doorway of the Dexter Horton and Company stone Bank Building at the corner of Commercial and Washington Streets. The elevation of the point was 9.6′ in elevation above the zero point which was determined by taking an average of seven high tides from August 1891 to August 1892.

During the great fire of June 6, 1889 the original datum point was destroyed and Ordinance 1836 was passed in 1891 establishing a new datum point in harmony with the first. This point was referenced to the lower step at the entrance to the Pioneer Block, at the southwest corner of the block, and was 18.79′ below the top of the step. The City of Seattle's datum thus established is still in use today.

Horizontal control for the City was never as firmly established in that no fixed datum has ever gained City-wide usage until recently.

In January 1893 the City standard meridian was established by Ordinance 2543 and was perpetuated by monuments established at Yesler Way and Broadway, and at Broadway and Madison Streets. This base line was seldom used and in later years was abandoned unofficially in favor of the tideland meridian. The tideland meridian was established during the period 1892 to 1900 by the State Land Commission. M. Stixrud was the Engineer in charge of the Seattle Harborline survey and the coordinate system that evolved from these surveys is often referred to as the Stixrud or tideland coordinate system.

It was at this same time the "H" line was established. Points on this line have been recovered and are still in use today.

In 1911, the Engineering Department began a series of plane table surveys making contour maps of 5190 acres covering most of the City except for several hundred acres in the vicinity of Fort Lawton. These contour maps were accurately made and valuable for the extension of streets, sewers, and water service.

As early as 1915 an attempt was made to establish a mapping program whereby survey data and recorded property information could be coordinated and recorded on maps for use by the Department.

The first attempt was 1″ = 200′ scale section maps showing distances and angles taken from the survey notes, but not showing platted lots and blocks. It soon became obvious that the scale was too small and since these maps did not show lots and blocks they could not be used for assessment maps. The quarter section maps were then made at 1″ — 100′ scale and showing lots and blocks primarily for use in enlarged assessment areas. Gradually these were improved by adding field measurements. During the depression years a system of balanced sections was built across the south part of the City from Lake Washington to Puget Sound using the coordinate system of the State Tide Lands and Shorelands.

Very little work was done during the following years until early 1957, when a Mapping Section was organized within the Survey Engineering Section.[1] An agreement was reached with the United States Coast and Geodetic Survey to establish additional control points in the City. Utilizing these new points and existing coast Survey control our cadastral surveyors then began building a network of control, based upon the Washington State Coordinate System, for the City. New maps were prepared, starting in the newly annexed areas in the north part of the City. The program moved slowly at first but gained momentum as new equipment and new techniques were tried. A theodolite, for more accurate angular measurement, was added to the field equipment and in 1963 a Geodimeter was purchased for faster and more accurate distance measurement.

The office mapping crew was in the meantime finding ways to improve and facilitate their portion of the work. Scribing rather than ink drawing was tried and soon became standard procedure.

The original accuracy was improved upon and maps were being produced in conformity with the State Wide Control System providing data agreeable with County, State, and Federal projects within and adjoining the City.

The new maps provided, not only lot and block information, but also accurate balanced field angles and distances coordinated with deed and condemnation records as well as plat information and references to rights of way acquired.

From a meager beginning, the "X" marked stone on Commercial Street and the datum point on the Dexter Horton Bank Building and from the Gunter's chain and the Cruisers compass, Seattle surveyors have developed a system of control involving thousands of street intersection monuments, bench marks, triangulation stations and trilateration control points throughout the City. The Mapping program is one of the best in the nation for the recording of property and survey data.

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[1] Previously, a single individual in the Design Section had sole responsibility for all map record work.

CHAPTER 18

The City Engineer's Office

I

WHEN Seattle was first incorporated in 1865, the articles of incorporation stated that the roads, streets and alleys were under the exclusive control of the Board of Trustees, and all improvements, repairs, grading and cleaning were to be done by them. The little town being scarce of funds, a road tax was levied to aid in road building. A later provision exacted a day's labor for each $1,000 of taxable property. A road poll tax had been first assessed in 1857 and diminished from $9.00 per individual to $4.00 by the time it was abolished in 1913. A man's labor by the day was worth two to three dollars; a man with road equipment received $4.00. Payment was by certificate which was acceptable for the road taxes only during the first years but later could be applied to the property taxes. Age limits were between 21 and 50 years, and all males except ministers, the infirm and public charges, were required to work out taxes. In some cases, however, a road property tax could be paid in cash.

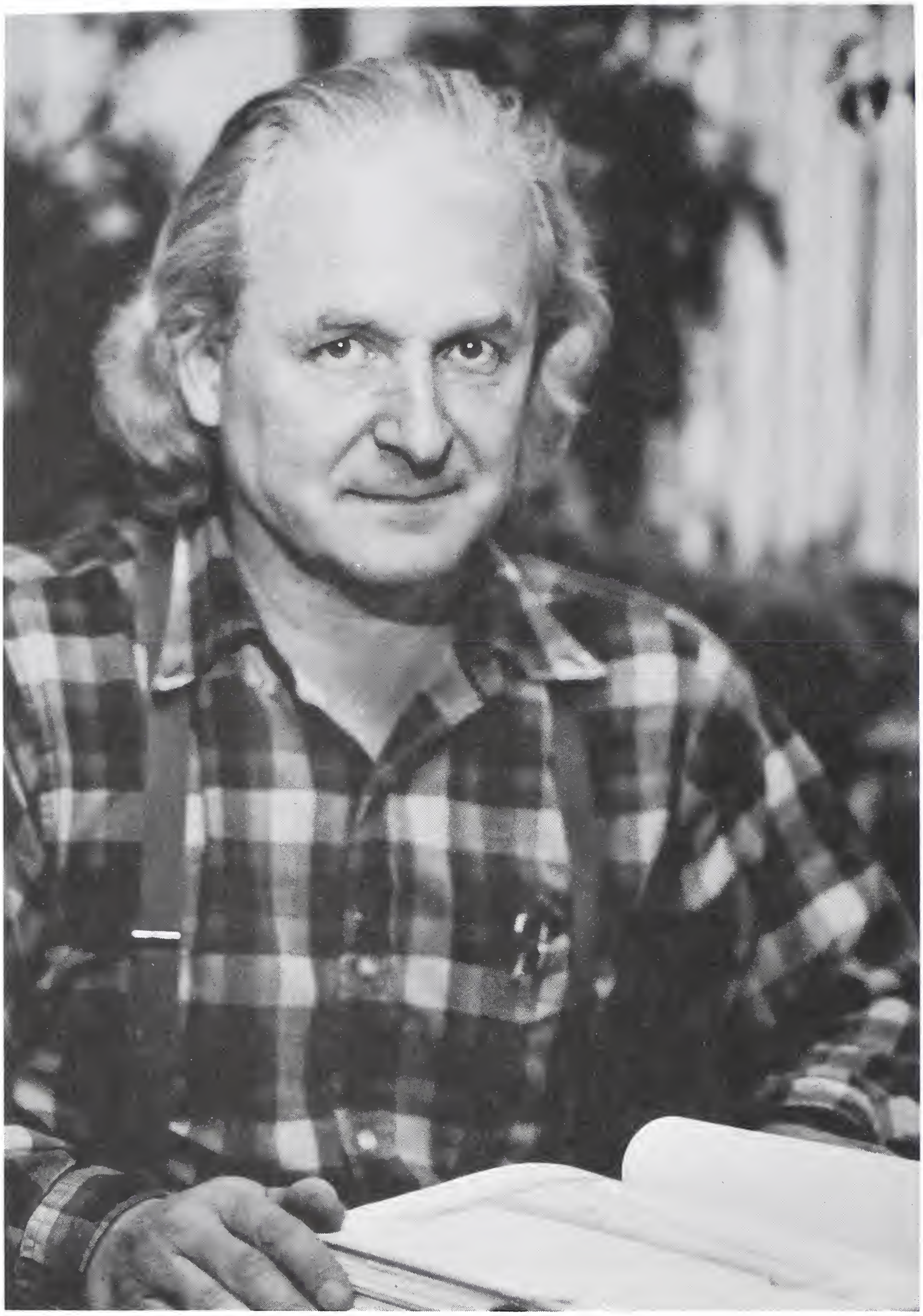
The town of Seattle was not included in the county road district, and the road tax for the area within the town was to be collected by the town marshall and spent as directed by ordinance. People wanted improved streets but owners of abutting property were unwilling to spend the money and the tax fund was insufficient to meet the needs. The grades were too steep to travel in many cases, and many of the roads ended at private property.

Most county roads began in Seattle during the earlier days. The great distances between places was a disadvantage for both City and County; road

Myra Phelps, author, historian, secretarial supervisor.

building in the difficult terrain was too costly for the resources of either unit to bear alone. Many roads were privately built by groups of people who wanted to increase the ease and safety of travel between the scattered settlements.

Laying out and grading suitable roads and streets was thus a continuing problem from the very beginning, and soon demanded the services of a



Leslie Blanchard, amateur historian and collector. His writings, in addition to his contributions to the present volume, include "The Street Railway Era in Seattle" (1968), "Lighting By Electricity: 1800–1882" (1971) and "A Century of Lighthouse Engineering" (1974–6).

professional surveyor. Except for a somewhat apocryphal reference in Prosch's *Chronòlogical History of Seattle* to the work of one H. J. Stevenson, who in 1865 was "instructed to prepare and present a uniform grade system for the streets of the town, the ups and downs of the sidewalks and the streets of that time being awful," no record seems to exist which indicates exactly what provisions the earliest townspeople made for obtaining the service of a surveyor, or for prescribing his duties and remunerations. Not until 1873 does the title of "City Surveyor" or "City Engineer" appear in any published ordinances, charter provisions, or other official record. Section I of an act of 1873 provides that there "shall be elected as hereinafter specified, a recorder, treasurer, marshall, city engineer (sic) and an assessor and collector, who shall be officers in the municipal corporation."[1] The engineer was to be elected by the common council. The next mention of the office occurs in a Charter Amendment of 1877 where it is referred to as "City Surveyor"; and the first spelling out in detail of its duties occurs in an enactment of 1883, which empowered the city to "provide for the survey of the blocks and streets of the city, and for making and establishing the boundary lines of such blocks and streets, and to establish the grades of all streets within the city; and to lay off, widen, straighten, narrow, change, extend, vacate and establish streets, highways, alleys and all public grounds, and to provide for the condemnation of such real estate as may be necessary for such purposes."[2]

Two years earlier an ordinance (No. 256) had fixed, apparently for the first time, the salary for the position; it provided the munificent sum of fifty dollars per annum, payable quarterly, but provided, as a sort of generous afterthought, that "the city council shall have power at any time to increase his compensation in cases where extraordinary services are required of him."[3]

Records indicate that twelve individuals filled the position of City Surveyor from the time it was created until the Charter Revision of 1890 changed the title to City Engineer.[4] One of these was R. H. Thomson, whose name was to appear with such frequency in the later annals of Seattle's engineering and construction achievements; another was Major

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[1] Compiled Charters of Seattle, 1869 to 1886, compiled and edited by Clarence B. Bagley, 1910, p. 24. An act "to establish initial and standard monuments for the survey of the streets of the City of Seattle," specifying the setting of monuments at most of the important street intersections in the city, was enacted on the very next day (Ibid. p. 23); so the charter provision for the position of City Surveyor certainly seems to have been made at a propitious time.

[2] Ibid.

[3] Revised Ordinances of the City of Seattle, W. T. AD 1888, p. 192.

[4] See the complete list of City Surveyors and City Engineers on pages 277–279.

Philip G. Eastwick, who almost single-handedly established the "official" gradients and alignments of the streets in what is now downtown Seattle, and who established the earliest datum point for Seattle (described in the preceding chapter). Major Eastwick came to Seattle in 1875 and formed a partnership with the firm of Morris and Whitworth, under the new firm name of Eastwick, Morris & Co., Civil Engineers; in 1876 he was made City Surveyor, a position he held until 1878. During these two years he established the permanent alignments of all the streets between Front Street, and 9th Avenue, the latter being at that time no more than a cow trail through the virgin timber; he also set the grades which were used, with little deviation, for more than 30 years, or until the massive regrading projects of the 1900's.[5]

Seattle's First Freeholder's Charter was adopted in 1890. It provided for the City's Government to be administered by a Mayor and Council, the latter to consist of a Board of Aldermen and a House of Delegates. Nine members comprised the Board of Aldermen, elected at large and presided over by the Mayor. Two members of each ward, or administrative division, were elected to the House of Delegates.

The Department of Public Works was one of thirteen functioning departments established by the 1890 Charter. It consisted of three members appointed by the Mayor and approved by the Board of Aldermen, for terms of three years. Not more than two of the three members could belong to the same political party; they were required to be electors and freeholders, and were not permitted to be members of any other official city organization. Appointment on one member was made on the first of each January; the member with the shortest term was selected as chairman; and the three then elected a secretary who was not a member. Semi-monthly meetings of the Board were prescribed. Duties consisted of certifying all bills and claims of contractors on public works and supervising all the City's building and construction activities, and all other activities taking place on City property; appointing superintendents for water works, sewers, buildings, bridges and wharves, and appointing a Street Commissioner and a City Engineer. The latter was charged with the making of recommendations for improvements such as extensions of the sewer system, grading and paving of streets, and so forth. The Board of Public Works was further responsible for the awarding of construction contracts on behalf of the city.

The Freeholder's Charter of 1890, as indicated above, established the position of City Engineer and undertook for the first time to spell out its qualifications and duties in precise detail. It stipulated that the City Engineer should be skilled in the profession of civil engineering; and his duties

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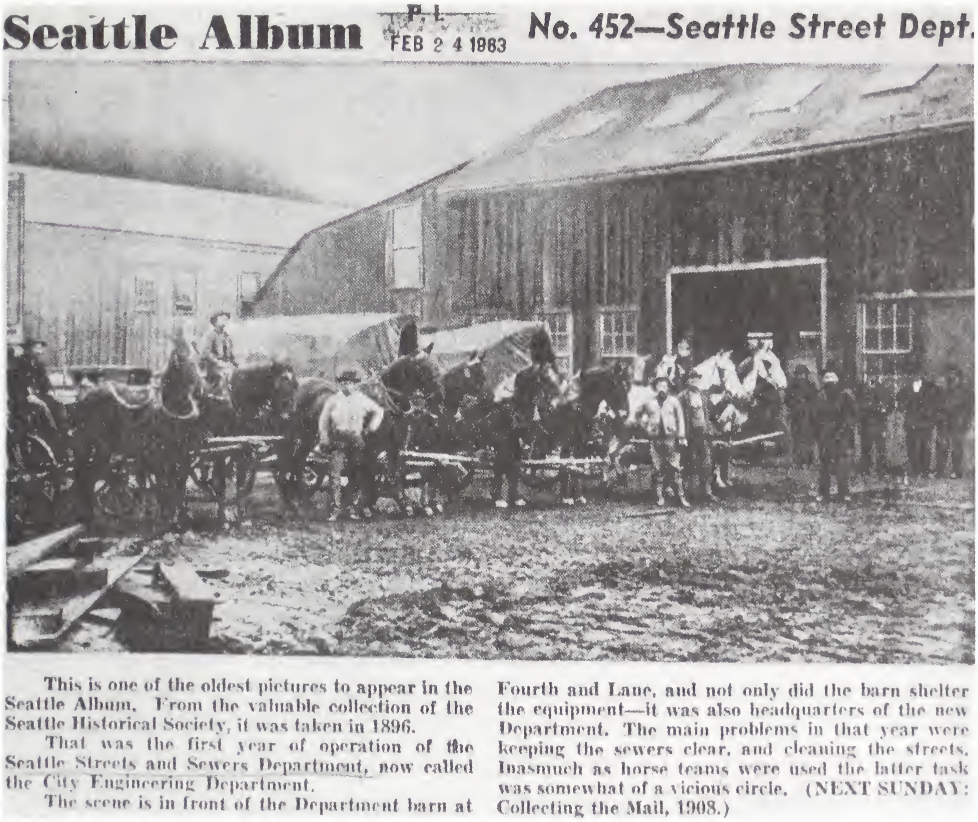
[5] Eastwick later platted Tacoma, made the original survey for the Lake Washington and Lake Union Ship Canals, and laid out the Cascade Locks on the Columbia River. The old street grades in downtown Seattle were usually referred to as the "Eastwick Grades."



Seattle Album P.I. FEB 24 1963 ***No. 452—Seattle Street Dept.***

This is one of the oldest pictures to appear in the Seattle Album. From the valuable collection of the Seattle Historical Society, it was taken in 1896.

That was the first year of operation of the Seattle Streets and Sewers Department, now called the City Engineering Department.

The scene is in front of the Department barn at Fourth and Lane, and not only did the barn shelter the equipment—it was also headquarters of the new Department. The main problems in that year were keeping the sewers clear, and cleaning the streets. Inasmuch as horse teams were used the latter task was somewhat of a vicious circle. (NEXT SUNDAY: Collecting the Mail, 1908.)

Courtesy of Seattle P.I.

Seattle Street Dept.—1896

were thus specified: "to make all surveys, plans, specifications, maps, plats and estimates for any and all public works and improvements in the city, or on property belonging to the city, and to perform such other duties as may be required of him by the board of ordinances of the City."[6] The following year an ordinance was enacted that further specified and delineated his duties; it required him to keep an office in rooms provided by the City Council, authorized him to employ such assistance as he required, and to employ consulting engineers, subject to the approval of the Council; made him responsible for the execution and care of all papers, plans, surveys and other documents pertaining to his work, and obliged him to make monthly accountings to the Council regarding employees, expenditures and other details of his work.[7]

The 1896 Charter revision, while not significantly changing the duties of the Board of Public Works, abolished its status as a citizen's group, and redesignated its membership to consist of the City Engineer, who was chairman, the Superintendent of Streets, Sewers and Parks, and the Superintendent of Lighting and Water Works; as before, these three selected a secretary who was not a member. A further reorganization in 1908 increased the Board's membership to five; City Engineer, Superintendent of Streets and Sewers, Superintendent of Lighting and Water Works, Superintendent of Buildings and Superintendent of Public Utilities; this last position, as indicated in Chapter 10, having been established that same year. In 1910 the position of Superintendent of Lighting was created, and added to the membership of the Board thus dividing Lighting and Water into two separate departments.

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[6] Revised Ordinances of the City of Seattle & Freeholders' Charter, 1893, p. 73.

[7] Ordinance 1602, ibid., pp. 217–9.

II

Earlier chapters of this history have dealt primarily with the public works which were undertaken in Seatttle under the aegis of the City Engineer's Office. In the present chapter we have attempted to trace, as far as surviving records will permit, the evolution of the Office of City Surveyor from its humble and somewhat obscure beginnings of the comparatively prestigious position which it had come to occupy by the first decade of the Twentieth Century. But of the earliest days of the office itself—its internal organization, working conditions, employee relationships and so forth—we know next to nothing; even its location prior to 1891 is a matter of uncertainty. This is not really too surprising; to begin with, very little pertaining to this aspect of the Department's history ever was written down, and most of that was communicated in the form of letters and memoranda which invariably disappeared during the "housecleanings" that such offices habitually conduct from time to time. The fire of 1889 destroyed nearly all the older City records, and further insured that most of the details of day-to-day work in the City Surveyor's office would be lost forever to historians.

The original Seattle City Hall, built in 1882 and destroyed in the fire, was at Second Avenue South and Washington Street; we may conjecture, without being certain, that the City Surveyor's Office was also located there. The original County Court House on Third Avenue between Jefferson Street and Yesler Way had been built that same year, but by 1891 the County had outgrown these quarters and had built and occupied a larger structure on the present site of King County Hospital. It then sold its abondoned quarters to the City for use as a City Hall; and by the latter part of 1891, following extensive remodeling, addition and shoring up of the structure, the Municipal Government, including Mayor's Office, City Council, Police Department, City Jail, Treasurer's and Comptroller's Office, Building Superintendent, and City Engineer, had all moved in and set up shop. The new quarters, expected to be fully adequate for several years, were, in fact, found to be insufficient even before they had been fully occupied. Constant addition and expansion became necessary over the years, and the building, "with its clinging additions resembling friendly barnacles borne in on the tides of adversity,"[8] soon acquired the not very flattering sobriquet of "Katzenjammer Castle." Overcrowded and insanitary conditions prevailed from the very beginning; and the following anecdote, recorded by McWilliams, is characteristic:

"A delegation of women called upon (City Engineer R. H. Thomson) to invoke his aid in bettering conditions in the City jail. They were received and listened to with utmost courtesy, and when they had rounded out their discussion, Mr. Thomson admitted that the deplorable conditions were well known, and that he was doing all within his power to influence his friends and acquaintances to keep out of jail."[9]

The City Engineer's office, following the universal practice of the day, preserved copies of all its written documents in letter press books; a few of these have escaped the decimation of various thoughtlessly expedient "housecleanings" to give some intimate glimpses of the Engineering Department's office activities. Under date of July 27, 1891 we find a letter addressed to T. C. Mendenhall, Superintendent of the Office of Weights and Measures, by City Engineer Albro Gardner, requesting that office to test and graduate a Roe Steel Tape to be used as a standard for all City measurements.[10] An undated record, compiled during May of the next year, lists the following employees and their wages, and thus summarizes the expenditures of the Department for that month:

1 Assistant Engineer at $6.00 per day; 1 Transitman at $5.00 per day; 3 Draughtsmen at $4.00 per day; 1 Computer at $3.00 per day; 1 Inspector at $3.50 per day; 2 Chainmen at $3.00 per day; 1 Axman at $2.50 per day; each employed a total of 26 days, for a total expense of $38.00 per day, or $988.00 for the month. To this, add for Sunday Work in Tunnel (Lake Union Sewer) 3 days per month for transitman and party, $40.50, bringing the total to $1,028.00. Current expenses such as material for office, abstracts for street improvements, monuments for street intersections, carfares, etc. $140.00. Total expenses for the month, $1,168.50.[11]

A communication to the Board of Public Works, dated June 20, 1892, itemizes the estimated expense of the Department for fiscal 1893 as follows: Street Improvements, $9,000, Sewers and Streets, $2,500, Water Works,

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[8] McWilliams, Seattle Water Department History, p. 30.

[9] Ibid.

[10] Letter Press Book No. 1, p. 133.

[11] Ibid., p. 23.

$2,500, Routine Work, City Departments, $4,500, for a total expense of $18,500.[12]

Then as periodically in later times, the resources of the City Engineer's Office were often strained beyond their capacity. Some of the problems and perplexities faced by the Department in the early days, when to the burden imposed by vastly increased street improvements were added new City Charter provisions that completely changed the methods of circulating and certifying petitions and assessments for street improvements, were graphically detailed in a Department Report:

> "The new provisions necessitate a large amount of additional work in this department upon every petition presented. Petitions must receive signatures of the owners of a majority of the "front footage" on the street to be improved, each front foot being considered on the basis of a depth of 120 feet or to the center line of rectangular blocks of less than 240 feet between streets. Before any work is commenced or expense incurred, it is the duty of this department to check the ownership of every signer by comparison with an abstract of title, to calculate the "front footage" on the prescribed basis from the number of square feet in the district to be assessed, and thus ascertain if all the charter requirements have been complied with." [13]

Defective original surveys compounded the problem. In many instances whole additions had to be resurveyed before improvement petitions could be certified, while some of the original plats lying in the proposed improvement district were found to be absolutely unintelligible, and no survey could be worked out that would allow these plats to be brought into conformity with the established boundaries of contiguous areas without destroying some existing improvements.

Political complications were added to the Office's problems during the following year (1894). The Board of Public Works discharged City Engineer R. H. Thomson on January 18, precipitating an investigation by Mayor James T. Ronald, the up-shot of which was that two Board members were dismissed on grounds of "misfeasance, malfeasance and nonfeasance in office."[14] Thomson was reinstated forthwith and handed the additional responsibility of Sewer Construction, which had previously been under the direction of the Superintendent of Streets. With characteristic energy, Thomson completely reorganized his staff, and notably improved relations within his own department and with other departments of the City.

For all that, though, the millenium was not brought measurably closer. From 1898 onward almost every City Engineer's Report called attention to the urgent need for vault facilities to store "Office records of this department (which) have become very voluminous and exceedingly valuable."[15] Nor did City Engineer Thomson's interdepartment reorganization apparently go far enough; for late in 1908 we find the Computing Department the subject of a lengthy epistolary Jeremiad by its chief, Jesse Jackson, concerning the lack of co-ordination between it and the Grade Department (then a completely separate division, and destined to remain so until 1922) and the absence of communication between the Computing Department and the grade men, who were assigned to the various district engineers and who worked more or less independently of each other and of the Drafting Room.[16]

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[12] Letter Press Book No. 1, p. 462.

[13] Annual Report of the City Engineer, 1893, p. 2.

[14] Annual Report of the City Engineer, 1894, pp. 1–2.

The inadequacy of the Engineering Office's quarters in "Katzenjammer Castle," evident the very day the Department moved in, became more glaringly so with each passing year. Inclement weather made the situation critical, not only for the engineers, but for everybody else in the building. On January 24, 1902 Seattle was hit by a severe snowstorm; temperatures dropped to around 19 degrees; the steam heating system failed; and many department heads made no appearance at all. According to a news story for the following day:

> "That Seattle needs a new city hall was never better demonstrated than yesterday, when probably a third of the employees were forced to leave the building and repair to their homes for comfort. The strong north wind which blew a gale all afternoon would strike the side of the building and whistle through the many wide cracks. . . City Engineer Thomson made balls out of the snow that drifted in through the crack above his office window." [17]

Not until 1906, however, was work begun on the structure that still stands desolate and forlorn at Fifth and Yesler, nearly a quarter century after being abandoned by the City. Completed in 1909, it became the new quarters of the City officers, including the City Engineer, despite the fact that Mayor John Miller, in a message of January 4 of that year, admitted that the building was already inadequate to house all the City departments scheduled to occupy it, and that plans for still another municipal building should begin at once. On March 29, 1909 the City Council sat for the last time in Katzenjammer Castle; a few weeks later the rickety old structure burned to the ground.

For the Engineering Department, the move was very much a case of leaping out of the frying pan into the fire—or rather, as this excerpt from a letter to City Engineer Thomson from District Engineer C. J. Moore suggests, into the water:

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[15] City Engineer's Report for 1898–9.

[16] Letter to R. H. Thomson from Jesse Jackson, 12–7–08.

[17] Bagley Scrap Books, Vol. VI.

"Item No. 6. Area Walls leak.

"I wish to call your attention to the fact that we have a laboratory apparatus, chemicals, records, etc., that could not be replaced for $20,000. A great part of this must of necessity be stored or housed in the rooms under the walk, and it means absolute ruin for a large percentage of this material and apparatus if allowed to remain there during the winter with those rooms in the condition they are in now—not to mention the inconvenience and unsightliness of leaking, damp walls and an inch or two of water on the floors.

"Item No. 11. Light Extensions.

"In the suite of 7 rooms, only one has enough daylight to enable work to be performed even in summertime without the aid of artificial light. During the long winter months, it will be necessary to use artificial light in all the rooms during the entire day.

"Now, the lights that are provided are very good as far as they go, but they are entirely insufficient, and the controlling switches of some of them are very awkwardly situated in the Engine Room—a place to which we have not even access.

"We had some conversation with Mr. Joslyn, when we first moved in, concerning the system of wiring and the insufficiency of the lights, but there was no improvement. So we decided to put in what lights and connections that were needed out of the monthly appropriation for our laboratory maintenance, and complete arrangements with Mr. Ross of the Lighting Department to make the installations.

"This is the bill of fixtures to which Mr. Grant objects as not being charged to the proper fund. This may be true, and I have no desire to take over any of the work of Mr. Grant's department; but I do desire to put these rooms in habitable shape as soon as possible.

"At present the efficiency of our men down there is not more than one-half as much as it would be were they supplied with proper light and arrangements. The arrangement is a matter entirely our own, but we cannot complete our arrangements until the light and electric installations are complete and all the rooms are made habitable."[18]

One of the surviving letter-press books from this era contains a monthly account of positions, grades, salaries and "efficiencies" of all employees under the supervision of the department; the report dated January 15, 1910 is here selected as more or less typical:[19]

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[18] Letter Press Book No. 8 (C. J. Moore) pp. 70–72.

[19] op. cit., pp. 4 & 6–7.

CITY ENGINEER'S OFFICE

Seattle, Washington
January 15th, 1910

Mr. D. W. McMorris, Principal Assistant City Engineer.

Dear Sir:

In accordance with your request for monthly statement of the position, grade and efficiency of the employees under my charge, I beg to submit the following list:

GENERAL PAY ROLL:			Efficiency Rating
Fred C. Fields	Chemist	$125.00	125%
Corey, J. D.	Tester of Materials	125.00	125
Fred N. Weyant	1st Grade Draftsman	105.00	125
John A. Dunford	2nd do	100.00	110
P. T. Wiltse	Ass't. Dist. Eng.	133.33	125
Ward J. Terpenning	3rd Grade Draftsman	95.00	110
Paul L. Sweeney	2nd Grade Computer	95.00	125
J. R. Wood	District Inspector	105.00	125
A. B. Frasch	2nd Grade Inspector	90.00	100
W. O. Cooper	T. Inspector	3.00	125
Ira T. Lane	2nd Grade Inspector	85.00	100
John T. Doctor	T. Inspector	3.00	100
R. F. Blake	do	3.00	100
J. G. Priestly	do	3.00	100
REFUSE DESTRUCTOR			
D. McGuire	Superintendent	125.00	125
Otto Johnson	Furnaceman	3.00	125
Joseph La Rue	do	3.00	125
Tom Daly	do	3.00	100
M. Parcell	Deckman	2.50	110
S. G. Baughman	Crusherman	2.50	100
Chas. Wilkins	do	2.50	100
B. F. Miller	do	2.50	100
Wm. Plenderleith	Furnace Tender	2.50	100
Wm. Keith	do	2.50	100
Dexter Baughman	do	2.50	100
E. Perkins	do	2.50	100
Chas. Day	do	2.50	100
Tom Jones	do	2.50	100
Gust Lager	do	1.50	100
Wm. Wilson	do	2.50	100
Wm. Herd	do	2.50	100
Robt. Wallace	do	2.50	100
John Kane	do	2.50	100
Ed Roe	do	2.50	100
H. Baughman	do	2.50	100
ASPHALT PLANT			
C. W. Hall	Engineer	3.00	110
P. Schmidt	Roller Engineer	3.50	125
H. P. Haskinson	Asph. Roller Engr.	3.50	100

SPOKANE ST. GARBAGE DUMP			
Tom Breen	Garbage Dumpman	70.00	100
Al Witte	do	70.00	100
L. Baughman	do	2.50	100
Emil Gorbin	do	2.50	100
T. T. Sutton	do	2.50	100
Bevin Morestro	do	2.50	100
Giacimo Managlia	do	2.50	100
BRIDGES & WHARVES			
C. H. Eakins	Bridgeman	5.50	100
do	Bridge Foreman	5.50	
D. H. Brown	Bridgeman	3.50	100
R. Boyle	do	3.50	100
Ferguson	T. Bridgeman	3.50	100
C. H. Butler	do	3.50	100
J. W. Whitney	do	3.50	100
John Cline	do	3.50	100
N. Brother	do	3.50	100
Al. Guichon	do	3.50	100
A. Green	do	3.50	100
Dan Campbell	do	3.50	100
Peter Swanson	Bridge Tender	75.00	100

"Efficiency Engineering" was then at the height of its popularity and fashionableness, and the virus had infected the City Engineer's Office, along with most such offices and private businesses throughout the country, accounting for the "efficiency ratings" appended to each employee.[20]

Two years later the City engaged the services of Harrington Emerson's "Efficiency Engineers" to make a comprehensive study of all City departments with the aim of improving their overall performance. Along with a great deal of currently fashionable pseudo-science, the report did provide a valuable picture of working conditions and personnel relationships as they existed in the Engineering Department at that time. Extracts from the report, along with some of the consulting firm's more sensible suggestions (a few of which were later adopted), follow:[21]

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[20] Concerning the history of "efficiency engineering" and "performance" rating of employees in general, see Loren Baritz, *The Servants of Power,* (John Wily Science Editions, 1965) and Daniel Bell, *Work and its Discontents* (in *The End of Ideology,* Free Press, Glencoe, Ill., 1959) A longtime former employee of the Engineering Department has related a number of near incredible stories concerning some of the schemes proposed by the Emerson Company and the consequences, ranging from ludicrous to near-tragic, that resulted from their being actually tried out, in the Engineering Department and elsewhere. The impossibility of defining "efficiency" in the work performance of a human subject with anything approaching the precision with which the efficiency of an engine or other mechanical contrivance can be defined (not to mention the ethical presuppositions involved in such a definition) was one of the factors that led to the abandonment of this early concept of "efficiency engineering"; another was the rise of the "human relations" ideology pioneered by Elton Mayo and his disciples. These developments are discussed in detail in the two works cited earlier; see also William H. Whyte, *"The Organization Man,* Simon & Schuster, 1956, pp. 33ff; on Harrington Emerson, see Raymond Callahan, *Education and the Cult of Efficiency,* Univ. of Chicago Press, 1962.

> *Drafting Department:*
>
> The work of the Draftsmen has been well standardized, a uniform system of drawing and lettering has been adopted and unnecessary embellishments have, as a rule, been eliminated.
>
> In addition to the Chief Draftsman, the payroll for the first part of July shows:

2	Leading Draftsmen	@	$125.00 per mo.
7	First Grade "	@	105.00 " "
8	Second " "	@	100.00 " "
4	Third " "	@	95.00 " "
4	Third " "	@	90.00 " "
2	Fourth " "	@	85.00 " "
1	Fourth " "	@	80.00 " "

> The duties of these two leading draftsmen consist, in the main of assisting the chief draftsman and the checking of drawings. The payroll of computers for the first part of July shows the desirability for a more even distribution:

13	First Grade Computers	@	$100.00 per mo.
6	Second " "	@	95.00 " "
5	Third " "	@	90.00 " "
3	Third " "	@	85.00 " "
3	Fourth " "	@	80.00 " "

> A closer relation between the Computing and Grading Departments should increase the efficiency of both, and, considering the reduced value of local improvement work, one head might be sufficient.
>
> The July (1912) payroll for stenographers shows:

1	Chief Stenographer	@	$110.00 per mo.	$110.00
1	Stenographer	@	100.00 " "	100.00
2	2nd Grade "	@	85.00 " "	170.00
2	3rd Grade "	@	80.00 " "	160.00
1	3rd Grade "	@	75.00 " "	75.00
5	3rd Grade "	@	70.00 " "	350.00
				$965.00

> When compared with the amount of work that the Engineering Department should have to do, this expense is unquestionably excessive and a gradual reduction in the number of this force should be made.
>
> If all stenographers were located in a central stenographic office, considerable intermittent idle time might be eliminated and the total cost of this department materially reduced. . .

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[21] *Report on the Board of Public Works.* The Emerson Company, Efficiency Engineer, 30 Charles St., New York, 1912.

From the nature of the work, the qualities required to make a good inspector are these, knowledge of materials together with diplomacy and tact in enforcing compliance with that which, in the opinion of the inspector, is right and fair. That the various inspectors should possess these qualities in varying degree is only natural, and five grades with salaries varying from $85.00 to $105.00 per month should be maintained, promotion resting on length of service and the reports of the District Engineers.

Contracts being seasonal, the number of inspectors varies directly as the amount of work in progress. The inspectors are divided into four groups, each District Engineer receiving one, the size of the groups varying according to the number of contracts in each district. Owing to the scarcity of transfers from one district to another, inspectors do not receive the efficiency rating of more than one District Engineer. A regular arrangement for changing, so that each inspector could, in the course of a year, have an opportunity under each District Engineer would be productive of reports that would enable a more accurate efficiency rating to be made.

Blue Print Office:

The office of the City Photographer and Blue Printer is a desirable institution. Besides affording a plant that can turn out work promptly for any Department, it can handle drawings which it might be inadvisable to entrust to outside firms.

The charge for blue prints is as low as that charged by reputable firms and lower than that paid by neighboring cities for the same work. What records are available show that the office is not only self-supporting but is operated at a profit. The record for 1909 shows the cost per square foot to have been $0.0137, for 1910, $0.0125, and today, $0.0170. While this cost has increased, it is below the amount charged, the City thus continuing to operate at a small profit from city work and from the cash sales to individuals for prints of City drawings and maps.

District Engineers:

The District Engineers are future City Engineers. They are doing for the part what the City Engineer does for the whole.

The present division of the City of Seattle into four territories is, in spite of the reduction of actual improvements in these districts, being maintained, the assumption being that the District Engineer can thoroughly become acquainted with only a part of the City. While this is unquestionably true, we nevertheless consider that, when the local improvements, at present diminishing, shall have assumed a more regular and steady amount, a division of the City into three districts only would not materially affect the efficiency of supervision.

The District Engineers are the future City Engineers. They have risen from the ranks of Computers, Draftsmen, Chainmen, and Inspectors. For each of these latter positions a special entrance examination must be taken and passed. Records of employees serving both as computers and draftsmen or both as chainmen and inspectors are not frequent. Men that have worked on both office and field forces are distinctly rare. It is, therefore, a partially developed specialist that is being created under the present system, one that is hardly prepared to assume the duties of Assistant District Engineer.

A first grade Computer has little to look forward to, although there is a small chance of his becoming Assistant District Engineer. But working at $100.00 per month with little chance of promotion, and engaged on special work that will not directly lead to anything else, it is obvious that an energetic young man is not likely to remain. The Engineering Department is, then, appealing to a class of labor that is not the best. While it may be drawing men of ability and good education, it can retain such men only as will be content to pursue the same work at about $100.00 a month, until the possibility of a better opportunity may arise. A Computer or Draftsman that works steadily for eight hours is at the end of that time unfit for theoretical engineering study. The Engineering Department is, therefore, faced on the one side with the desirability for retaining the best men, while on the other is the necessity for economy in payroll. If there is no increase in salaries (for such a course would be attended by great increase in expense) the Engineering Department must resolutely face the resignation of employees after a few years of service and strive to obtain the best available labor in order to derive the best results during the years of employment.

The Engineering Department should be training future City Engineers, men with all-round practical experience and, since all the work to be done is such that under capable leadership and instruction could be performed by apprentices, there appears to be no good reason why its employees should not pass through each one of these divisions. The Engineering Department, should in short, while performing its work, be providing a course of practical instruction in Civil Engineering.

The work of this Department that can be designated as strictly engineering in character is paid almost uniformly. As examples may be taken the four divisions: Computing and Drafting, as Office Departments; Surveying and Inspecting, as Field Departments.

Taking as a possibility 35 or 40 men regularly appointed each year, to pass through a four-year course, starting at $65.00 per month and rising at the end of each year by $5.00 a month, their salaries would average $72.50 as against the present average of $92.00 per month. These men could be drawn from the graduates of The State University or from the International Correspondence Schools, and, except for an elimination of the unfit, could all work for one year in each of the Engineering Department divisions.

III

The new King County Court House Building was built in 1915 and dedicated in 1916; in May of the latter year the City Engineer's Office, along with all other City offices, except those concerned with law enforcement and public health, moved into rented or leased space in the new structure, and the old Municipal Building was redesignated the Public Safety Building. For the Engineering Department the move was an exchange of damp, crowded and ill-lit quarters for light, airy and spacious ones. The Department's new office was installed on the east half of the sixth floor of the new building, which, until the additional floors were added on in 1928 and 1929 was the topmost story; a kind of mezzanine on the upper half of part of the floor was occupied by the blueprint room. Since many blueprints were still made with the aid of sunlight, this arrangement was a particularly convenient one. The access to the roof was convenient in other ways too, for thither would many employees repair during the noon hour, when weather permitted, for a leisurely lunch or a game of "catch" or soft-ball, for both of which activities the roof area provided ample space. Working hours at that time, and for many years afterward, were 8 A.M. to 5 P.M., with an hour for lunch on week-days, and 8 to noon on Saturdays.

Prior to 1908 there were no annual salary ordinances, the compensation of the employees in each department being handled by the City Council as a separate and independent item. July of that year saw the enactment of the first general salary ordinance; but wages for the Engineer's office remained stationary until October 1, 1918, when an across-the-board increase of $15.00 per month was provided for each employee. On October 1, 1919, at the high point of war-induced inflation, a $20.00 per month increase was granted; but in 1922 this was reduced by $10.00 per month, and wages once again became stationary, or nearly so.[22]

An apparent overlapping of responsibilities between the City Engineer, the Street and Sewers Department and the Superintendent of Buildings led to some perplexity and inter-departmental friction during the early 1920s. City Engineer J. D. Blackwell thus described the resulting situation and explained how it was finally resolved:

"Under Section 7, Article 8, (of the City Charter) construction work of all kinds and for all departments devolves upon the City Engineer, while under Section 9 (a) of Article 8, the construction of municipal buildings devolves upon the Superintendent of Buildings, showing a seeming conflict in the charter. But as Section 9 (a) is a later addition to the charter, the ruling has always been that the later passage of its provisions annul so much of Section 7 as is in conflict therewith, and that construction of municipal buildings is placed under the supervision of the Superintendent of Buildings.

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[22] Comparison of these figures with wage data given earlier in this chapter will enable the reader to form a fair estimate of the remuneration which employees of the department received at various times during this period.

"Taking from the duties of the City Engineer, as defined in Section 7, Article 8, those later assigned to the Building Department, there remains among the duties of the Engineer, "to superintend and have the management and control of bridges and wharves, and of the construction and repair thereof." This latter provision called for a definition of "bridge" as distinguished from a street, the maintenance of all streets being within the province of the Street Department, and many planked ways supported on timbers being the only improvement over which street traffic is carried. Some controversy having arisen over the jurisdiction in this matter, early in 1922, the incumbent heads of the engineering and street departments got together and agreed upon the following to be maintained by the City Engineer.

1. 8th Avenue South Drawbridge,
2. First Avenue South Drawbridge,
3. Bridge over Railroad tracks at Juneau Street and Duwamish Avenue,
4. West Spokane Street Drawbridge,
5. Bridge over railroad tracks at Pike Street and Railroad Avenue,
6. Bridge over railroad tracks at Bell Street and Railroad Avenue,
7. Bridge over railroad tracks on Lawton Way at West Wheeler Street,
8. Two bridges over railroad tracks on West Wheeler Street at Lawton Way,
9. Bridge over railroad tracks on 15th Avenue West at Thorndyke Avenue,
10. Ballard Bascule Bridge,
11. Bridge over 90-foot opening in south approach to Ballard Bascule Bridge,
12. Bridge over Railroad tracks at Shilshole Avenue and 15th Avenue N.W.,
13. Bridge over Northern Pacific Belt Line Tracks at Fremont Avenue and Florentia St.,
14. Fremont Avenue Bascule Bridge,
15. Concrete approaches to Bascule Bridge in Fremont Avenue,
16. Bridge over Northern Pacific Tracks on Fremont Avenue at Ewing Street,
17. University Bascule Bridge,
18. Bridge over entrance to Waterway No. 13, in north approach to University Bridge,
19. Bridge over entrance to Waterway No. 13, in Northlake Avenue approach to University Bascule Bridge,
20. Bridge over Northlake Avenue in North approach to University,

21. Bridge on 20th Avenue N.E. in Ravenna (Roosevelt) park,
22. Bridge over Portage Canal on 23rd Avenue North,
23. Bridge on Yesler Way at 4th Avenue,
24. Bridge on 12th Avenue South at Dearborn Street,
25. Bridge on Admiral Way at West Stevens Street (Schmitz Park Bridge),

"They further agreed that henceforth all trussed and concrete bridge structures would come under, and be maintained by the Engineering Department, and the rest under the Street Department.

"Summing up the duties of the City Engineer, the following sets them forth as clearly as can be done briefly: To make and supervise the making of all studies, estimates and reports looking to the construction of new projects, other than local improvement projects and municipal buildings, as shall be required by the City, and, under the direction of the Board of Public Works, to prepare all plans, specifications, estimates, contracts, etc., for local improvement work, and to lay out, direct and supervise the construction of all public works, other than municipal buildings, within the city, or on property belonging to or controlled by the City that may from time to time be ordered by the City Council. It is ruled that when any public work is ordered constructed by the City Council, be it local improvement work or not, preparation of construction plans, specifications, estimate, etc., is under the supervision and direction of the Board of Public Works.

"In addition to the foregoing, the Engineering Department maintains and operates "bridges" as hereinbefore defined."[23]

During the 1920s, as in more recent times, employment levels fluctuated as work built up or slackened off. The computing section employed six persons in 1919, but its personnel and responsibilities were augmented three years later when the Department, rather belatedly concluding that the older arrangement delineated in the previously mentioned letter by Jesse Jackson was cumbersome and inefficient, put all the grade engineers in one place, so to speak, and made grade-setting the responsibility of the computing department. For many years after that reorganization, the employees of the department were referred to as the "water pocket engineers." Elsewhere in the office, the LID design section grew from half a dozen employees early in the decade to more than twenty during 1927–1928, the years of greatest activity. Not until the late 1950s would it again give employment to so many.

In 1928–29 the Engineer's Office was moved to the west side of the sixth floor; following the completion of the building to its present height in 1930, it was moved again, this time to the fourth floor, where it occupied space in the northeast corner; and very little space it required during the succeeding decade and a half. Depression in the 1930s and war in the early 1940s drastically curtailed the construction activities that had been its mainstay; the LID design section dwindled to less than half a dozen; computing and grade work was handled by a single individual, Ben Dale Keeney, who had assumed supervision of the newly consolidated section in 1922; and two survey crews, under the tutelage of Chief Surveyor George McMonagle (who had been with the Department since the early 1880s) sufficed for all departmental field work from around 1930 until the middle 1940s. The field engineering force dwindled in proportion, especially after the completion of the Second Denny Regrade and the Railroad Avenue Seawall,[24] both of which had helped to tide the Department over during the earliest years of the Depression. In 1912 four districts, or subdivisions were thought necessary properly to divide engineering responsibility; by 1919 there were three: North, Central and South; by the middle 1930s there was none.

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[23] City Engineer's Annual Report, 1924, pp. 5–7.

Two major changes in the composition and responsibility of the Engineering Department that took place in the early 1930s—the 1931 transfer to City Light of the engineering functions that had previously been performed on its behalf by the Department, and the transfer to the Department of many of the functions of the old Department of Public Utilities the following year—have already been discussed.[25] About the same time, or somewhat later (the exact date is uncertain) the Water Supply Department, formerly an autonomous division, was merged with the design section of the Engineering Department. At a special election in March 1936 a Charter amendment was approved which consolidated the Engineering Department with the Streets and Sewers Department, (which had been responsible for all street maintenance work) and, in addition, removed the Superintendent of Streets and Sewers from the Board of Public Works. This change was apparently effected in the interest of centralizing responsibility and saving money and manpower, inasmuch as the City Engineer was now made directly responsible for the work of both the construction and the maintenance divisions. An additional Charter amendment of that year raised and made more specific the qualifications of the City Engineer: to the earlier Charter provisions was added the requirement that "the City Engineer must be a civil engineer who shall have actually engaged in the practice of his profession for a period of five years prior to his appointment and who shall be the holder of a license to practice his profession in the State of Washington, if such license is required by the laws thereof."[26]

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[24] See Chapters 1 and 4, above.

[25] See Chapters 8 and 10, above.

[26] Charter of the City of Seattle, 1936, p. 29.

In the earlier decades of the century, Municipal Engineering was regarded as a specialized field, incorporating, to be sure, the expertise and theoretical insights of other engineering disciplines, but still essentially *sui generis*. Stress was therefore placed on learning by doing, the qualifications for the practice of municipal engineering being gained primarily by long and varied experience with a City's department; academic knowledge, though not necessarily downgraded or minimized, was regarded as playing a more or less ancillary role.[27] Accordingly nearly all the design work was done in the Department itself, and the service of private engineering consulting firms was very rarely called on. Among prerequisites for employment within the Department, academic qualifications were regarded as secondary to practical experience or, in the case of young or beginning employees, to the ability to learn by doing, and to assimilate the existing body of municipal engineering tradition. Native intelligence, common sense and willingness to learn were considered much more basic qualifications than academic attainment.

Office procedures reflected this same basically pragmatic orientation; routines were few, simple and flexible; relations within the Department were quite informal and friendly, and the Department itself was still small and geographically compact enough to permit most of the people to be on a first-name basis with each other, and for a general spirit of co-operation and mutual aid to prevail. All in all, in spite of relatively low salaries, unpredictable fluctuations of work load, and the occasional frictions and misunderstandings inseparable from any office situation, the Engineering Department seems to have been an unusually pleasant place to work in during the two or three decades following its removal from the old Public Safety Building.

During the earliest days the office equipment was rather primitive, and the Department does not appear even to have owned a typewriter until around 1892. Photos of the office taken around 1912 and 1913 (shortly after the move out of Katzenjammer Castle and into the old Municipal Building) show employees seated at rows of low tables, rather too closely crowded together for efficient and comfortable working[28] and with comptometers of various sizes and vintages conspicuously in evidence. This particular device, one or two examples of which can still be found in use in the Department, was the principal aid to computation in the early days, although they could scarcely substitute for the well dog-eared volumes of six and eight place logarithm tables which were so necessary in the more complex traverse and structural computations. In the early 1920s hand-cranked Monroe and Marchant calculators began slowly to filter into the office; after 1925 several motor-driven Marchant calculators, the first of their species ever put on the market in the United States, were acquired.[29]

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[27] This is brought out, at least by implication, in portions of the Emerson Company's report previously quoted; examination of articles published in the engineering journals of the time give the same general impression.

[28] Several letters and reports dating from this period make mention of lack of adequate working space in both the old and the new City Halls; not until the 1916 move to the County Court House did the Department obtain really spacious and comfortable working quarters.

The construction and design work that had been the Engineering Department's primary *raison d' etre* was drastically reduced by the Depression. Such work as the office's decimated work force undertook during the 1930s was primarily concerned with reordering, clarifying and codifying survey data, bringing old records up to date and correcting and refining older surveys. Little money was available even for this work; and keeping instruments in proper repair became a persistent problem, as evidenced by the following excerpts from the Department's 1937 Report—which, in addition, brought up once again the perennial question of storing and classifying city records and indicated, further, what the primary occupation of the office was during these years of economic doldrums:

"Surveying and Records"

"Planning for improvements of any kind must be founded upon actual conditions existing on the ground. For obtaining such information for permanent record we are at present employing two survey parties of four men each.

"For several years, we have felt much concern about intersection points in graded and ungraded streets, inasmuch as many of these points had not been uncovered for periods as great as thirty years. We realized that, without extreme caution, many would be lost, and, in fact, were being destroyed by inexperienced surveyors, of which the depression produced a large number.

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[29] The Department seems to have acquired a German-made "Saxonia" calculator around 1915. This was one of the first, if not the very first, mechanical desk calculators that was manufactured commercially. In 1918 or 1919 a convenient "accident" knocked it off a table and destroyed it. Whether a "patriotic" impulse or merely a desire for a quieter environment was responsible is uncertain; but the machine was perhaps the noisiest office contrivance ever put together, and though perhaps faster than logarithms, it was infinitely more nerve-wracking. Two other early computing devices, which were essentially elaborations of the slide rule principle, were also owned by the Department during these years: one, a cumbrous cylindrical affair known as the Thacher Calculating Instrument, was used until the Marchant calculators were acquired; thereafter banished to a dim and dusty recess of the Vault, it warped so out of shape that it was finally discarded: to nobody's overwhelming loss or sorrow, apparently, since no one had ever derived great satisfaction from using it. The same appears to have been the case with another even less practical contrivance: a paddle-shaped affair called, rather debatably, the Ross "Precision" computer.
The preceding three footnotes (27–28–29) have been based primarily on the recollections of older employees of the Department; in particular, of one individual who worked for it between 1919 and 1961.

"In November, the Council authorized the City Engineer to replace this most valuable data, and, during 1937, 220 had been replaced. We are now using a reinforced concrete hub three inches in diameter by sixteen inches long that we manufacture ourselves. We find that, by making a hole with the bar, these hubs may be driven as easily as wood. We have received much favorable comment upon their use.

"With the exception of three transits and two levels, all City instruments are very old—none less than 25 years. The use of the instruments is restricted by the number of tripods, since these have not been kept in repair. Only twenty-two of the total could be used at the same time.

"Since the formation of an Engineer's Department, field data has been collected in about 15,000 volumes, and is now being increased by about 100 books per year.

Naturally, there is included in these records much worthless information which has no value as a permanent record and we are convinced that we are not only storing much junk, but that the effort of finding worthwhile data is vastly increased by having to segregate the good from so much trash.

"I would recommend that funds be provided to have these books thoroughly culled; that the useless ones be stored outside the vault; that our index be revised so as to cover only the books containing valuable data; and that a secondary index be made to cover the discarded volumes; in which event we will adopt a system of permanent records and temporary records; permanent records to be placed in well-bound books and preserved, temporary records to be placed in very cheap books to be preserved only so long as they are useful, then discarded or placed in secondary storage.

"We have also arrived at an age where our old records must be *respected* and *restricted*. Certain very valuable old books should be copied for use and the originals withdrawn from circulation and use. Funds should be provided for this work."[30]

Depression and war-time doldrums in the Engineering Department came to an abrupt end with the cessation of hostilities in 1945. An enormous accumulation of urgently needed construction and repair work, the heritage of 15 years of stagnation, faced the city. In 1946 an eleven million dollar improvement program, the first of several ambitious and far-ranging efforts to catch up, was set in motion, resulting, on June 10 of that year, in a request to the City Council for $111,590 to pay for additional supplies and personnel.[31] But the ensuing expansion of the Department, spectacular as it was in comparison with the preceding fifteen years of inactivity, was still insufficient to cope with the ever-increasing burden of work that was placed on it; and by April 15, 1948 the Department was obliged to report, in a final successful bid for additional help from the City Council, that it was "snowed under" by a mass of projects designed to accommodate booming postwar economic development.

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[30] City Engineer's Annual Report, 1937, pp. 23–4. A quarter of a century after this last recommendation was made, a microfilming program was begun which achieved at least part of its objective.

A provision of the new City Charter adopted in 1946 had extended the terms of both Mayor and City Engineer to four years. R. W. Finke, the first City Engineer to be appointed under the new system, assumed the office on May 3, 1948, and detailed the "unprecedented mass of work and problems that is taxing its functioning facilities to the utmost," adding that "they are largely connected with the five-year post war development program." Virtually the same complaint was voiced exactly a year later when Mr. Finke reported that a heavy burden was being placed on the surveyors as a result of the press of public improvement throughout Seattle. The City was, in fact, attempting to accomplish in five years what ordinarily would have taken twenty, and the resulting strain was being felt with particular acuteness in the Engineering Department. By May 23, 1949, notwithstanding all this, Mr. Finke confidently predicted that the 22 million dollar backlog of public works would be halved by the end of the year.

Five operating divisions comprised the organization of the Engineering Department during the immediate post war years: Design & Plans, Construction, Administration, Maintenance and Traffic; each was headed by a Principal Engineer, who was, in turn, responsible to the Principal Assistant City Engineer and the City Engineer.

An urgent requirement in the immediate post war years was a new shop complex at the Department's Charles Street Garage. The original $370,000 appropriation was made to cover the cost of construction of only half of the new shop structure. As the need for the entire facility had become critical, the Department, on March 15, 1949, successfully petitioned the Council for an additional $206,000 from the Cumulative Reserve Fund to complete the new shops, designed to requirements established by Assistant City Engineer James Robertson. The contract for this facility was let on the 31st of the same month; on May 19 of the following year, it was completed and formally dedicated by the Mayor. On June 1 of the same year (1950), the Department reported that seven million dollars' worth of new construction had been completed during the preceding year.

By the early 1950s most of the deferred construction and maintenance work which had nearly swamped the department during the immediate post war years was completed; but far from slackening off, the work load continued to increase; and during the entire decade after 1952 the manpower situation remained critical. The huge upcoming annexations in the North and South ends added to the burden, and an emergency appropriation of $424,611, together with an addition of 33 persons to the staff and a salary appropriation of $95,319 was found to be necessary merely to keep abreast of the tide.

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[31] The source for most of the figures and dates mentioned in the following discussion has been the newspaper clipping file under subject head "Engineering" in the Seattle Municipal Reference Library. All quotations, unless otherwise indicated, are from the same source.

The newly annexed areas immediately began petitioning for vast sewer, grading and paving projects; and this, combined with the routine maintenance that these areas required, added some more straws to the camel's already dangerously overburdened back. Top priority was given to the expansion and modernization of the Haller Lake Shop complex, which the City had acquired from the County in 1953, just prior to the annexation, and in anticipation of the added maintenance demands that this would make on the Department. The land area that originally came with this being soon found insufficient, condemnation proceedings were initiated in January 1955 to acquire 3.12 additional acres; and from then until the end of the decade the completion of a new headquarters building (for which $277,000 was appropriated from the 1954 Arterial Funds Bond in 1957) was a matter of concern to the Department.

By 1956 requests for additional employees and funds were becoming more or less routine; and on November 10, 1956 City Engineer Parker made one of several pleas for assistance to the Council, pointing out that the vast construction program was making demands that the present force was unable to cope with. On January 29 of the following year, the same plaint was reiterated, with variations and elaborations:

> City Engineer W. E. Parker reported that the Engineering Department is finding it difficult to plan and carry out essential projects because of an acute shortage of engineers. "Private corporations, usually paying better salaries 'grab off' engineering graduates of Universities. Those the city gets often stay a while and then leave for jobs they find more attractive."

So far as the Seattle Engineering Department was concerned, the 1950s were memorable for two things: unprecedented national and local prosperity, stimulating equally unprecedented interest in and willingness to finance local improvements, and (as indicated above) a near-critical shortage of qualified engineers. The department was able partially to alleviate the latter situation by hiring a disproportionate number of "sub-professional" engineering workers, along with such employees in the higher "professional" echelons as it was fortunate enough to get. This influx of new office workers, which reached a peak in late 1957 and early 1958, brought to a head still another problem that had been getting more and more serious since the beginning of the decade-office space. On February 2, 1957 City Engineer Parker had officially indicated the magnitude of this need, estimating that 5,000 additional square feet of floor space would be required immediately, and regretting that this had not been provided for in the plans for the addition to the City Light Building, the construction of which began later that year. As a temporary expedient the Bridge Design and Traffic Divisions were installed in rented quarters in the Smith Tower and in the new Public Safety Building, which had been completed January 19, 1951, after John B. Cain, Superintendent of Buildings, had convinced Mayor William F. Devin that the old Public Safety Building was "no longer safe for heavy files or a safe on any floor above the ground floor."

Available space steadily dwindled, notwithstanding; and by early 1958 crowded conditions, reminiscent of the situations that had existed almost fifty years earlier in the old Public Safety Building, prevailed throughout the department; and the addition of each new employee posed a minor crisis. By the end of that year practically every square inch of space on the Fourth floor of the County-City Building was occupied; employees of some sections were crammed into separated niches or corners where room could be found or made; and the thought of what might happen in the event of an emergency that required hasty evacuation of the building was producing more than its quota of grey hairs on official heads. Early in 1959, as another temporary expedient, several departments were relocated on the third floor, but another influx of new people made necessary by new Sewer Projects, partially nullified the effects of this move.

During World War II, scarcity of materials had forced delays on many City projects. With fine foresight, David Levine, chairman of the City Council Finance Committee, proposed in 1944 the creation of a Cumulative Reserve Fund, to be used at Council discretion in later years. This made possible an immediate and permanent solution to the above space problem.

A seven-million-dollar appropriation from the Cumulative Reserve Fund to finance the construction of a new Municipal Building was approved. A special committee of Department heads, chaired by Councilman J. Dorm Braman, guided design plans of Damm, Daum and Associates and J. M. McCammon Associates, Architects.

Clearing of the site began in January 1961, and by October 5, 1962 the Seattle Municipal Building was completed and ready for occupancy. July 16, 1962 was the date on which the Seattle Engineering Department offically set up shop in the new building, putting all the Department's offices and subdivisions under one roof for the first time in many a year. One unfortunate aspect of the move, and of the haste with which it had to be carried out, was that hundreds of historically invaluable records and documents that had been stored in the old quarters were thrown out. (But be-

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fore this happened, ye editor was assigned the task of researching the musty files, so essential to the start of this history) .

A Civil Service reclassification of the late 1930s had eliminated the old titles of Computer and Draftsman and created the new ratings of Senior and Junior Aide and Junior Engineer that partially encompassed and partially overlapped the older classifications. A further reclassification in 1958 represented an attempt to resolve a problem that had been growing increasingly troublesome over the preceding several years. Parallel with the rapidly increasing complexity and sophistication of modern science and technology, the requirements of the engineering profession were also becoming more complex and sophisticated; the more advanced areas of mathematics and physical science were becoming an integral part of the engineering curriculum; and throughout the profession it was being more and more generally accepted that formal college education was a necessary requirement for the successful practice of most branches of engineering. Like almost everything else in contemporary life, engineering was being divided into ever smaller and more sharply delineated sub-specialities, each of them requiring a prolonged and specialized training in addition to ever more rigorous fundamental education. By 1957 the time had apparently come to modify the employee classifications and the requirements therefor so as to bring them into line with the altered requirements of the engineering profession; and so in March of that year a new classification was proposed which sought to provide a series of more or less parallel ratings, and thus to divide the department's employees on the basis of possession of engineering degrees into "engineer" and "technical assistant" or "specialist" job titles. The original version of the plan generated a great deal of criticism and opposition, particularly among the older employees, most of whom were more or less brought up in the older Municipal Engineering tradition spoken of earlier. Many of these had gotten their engineering education in the "school of hard knocks," and only secondarily, if at all, in colleges or universities. Although a more or less workable compromise was finally arrived at the following year, the handwriting was clearly on the wall; and the Seattle Engineering Department as well as City Light and other subdivisions of the City making use of engineering expertise would come in subsequent years to make possession of an engineering degree an ever more basic and inflexible requirement of employment within the City in all professional engineering capacities.

The compromise measure finally adopted created parallel classifications of Assistant Engineer I and II and Engineering Specialist I and II, eliminating the older classification of Junior Engineer and adding, in later years, a third grade to the Specialist classifications, to allow for advancement of those employees who did not possess the degree requirements for the engineering positions. The first competitive examinations for these new classifications was held in early June, 1958. Then, as at various later times, attempts were sponsored by Civil Service to add college degree requirements for promotional as well as service entry examinations. Until recently these were bitterly and usually successfully opposed by the older employees, and by the Professional and Technical Engineer's Association (of which more later) ; but once again the trend of the time has proved well-nigh irresistible, and as the employees representing the older tradition have one by one left the service and as the ideals underlying the changed requirements have more and more come to be accepted, the original objective requiring college graduation as a minimum requirement for all engineering positions within the city has come closer and closer to realization. (Possession of an Engineer-in-Training certificate is accepted as a minimum qualification for promotional positions in lieu of an engineering degree; but the necessary examination is next to impossible for anyone who is without a thorough and up-to-date academic background in engineering to pass).

Procedural and organizational changes, slow-paced as long as the Department had remained in its old offices at the County-City Building, developed more rapidly once it had settled into its new quarters. A Management Office was added to the Department's subdivisions in 1962; and the "critical path" method was made the basis for all project planning during that same year. In May 1965, the old District Engineer arrangement that had persisted, in one form or another, since the early 1890s, was finally abolished, and the various Resident Engineers were made directly responsible to a Principal Construction Engineer. The specific modification of the old arrangement thus superseded, consisting of a North and a South District Engineer to whom the individual Construction Engineers had been responsible, had been put into effect shortly after the end of World War II.

Problems had arisen as a result of each District Engineer evolving his own set of construction standards entirely independent of the other. The North District Engineer, for example, consistently advocated a crowned or peaked roadway section for paving, while the South District Engineer preferred a flat one, with drainage on one side only.

The Department, as indicated in the preceding chapter, acquired a Geodimeter in 1964 and began, with its aid, a comprehensive program of establishing accurate survey monuments throughout the City and rationalizing the older surveys. A long range program for recalculating all the old quarter-sections and correlating and making consistent the data thereon began in 1958, shortly after the establishing of the present mapping section within the computing section (which at a now unspecifiable date had acquired the more pretentious appellation of "Survey Engineering Department"); and it is still continuing. The earliest quarter-section maps had been compiled for strictly cadastral and assessing purposes and had contained virtually no alignment or linear dimension data; on some of them even the street names were missing. During the Depression a program for updating and correcting these old quarters was carried on in the Department office under the aegis of the Works Projects Administration; these added location book data when available and established Lambert Grid bearings and co-ordinates at the section corners; but since original survey data was lacking in many areas, the program was necessarily fragmentary and incomplete. The present ongoing program was designed to fill in the gaps and to rationalize existing data so as to bring it into conformity, whenever possible, with Lambert Grid data.

Since around 1962 the Department had been availing itself from time to time of the facilities of the North West Computing Center and the University of Washington.[32] By late 1967 the time seemed ripe for more or less continuous access to a computer, and in November of that year a computer terminal was installed in the 8th Floor of the Municipal Building, with the General Electric Time Sharing Service providing the computer connection and the necessary local hardware. A "quickie" one-day course in Basic Language was provided by the same organization for the benefit of the employees who were expected to make use of the computer facilities; it was designed, as the instructor put it, to give the student "just enough programming knowledge to make him dangerous." It did.

The inevitable beginning difficulties and contretemps notwithstanding, the service proved to be so popular that additional computer terminals, with connections to IBM as well as GE computer resources, were quickly installed and an impressive array of programs in Basic, Fortran, Algol and other computer algorisms was rapidly built up for the more common problems in traversing, structural analysis, area computation, cost estimating, and the like. Demand for the service within the Department soon exceeded even the capacity of these expended and improved resources, however, and another large scale expansion is planned for the near future. The Management Consulting firm of Arthur Young & Co., which during 1970, 1971 made an extensive study of the Department with the aim of developing a more efficient management structure recommended, among other things, a greatly expanded role for the computer in the Department's work, including such activities as accounting, graphics and traffic study.

Another of the consulting firm's objective had been to determine the relative economy and effectiveness of "in house" engineering design work as opposed to that done for the City by private consulting firms. Design work which, over the past several years, had been accumulating much faster than the Department's own personnel has been able to handle it, had made it necessary to rely to an ever-increasing extent on the service of consultants; and the Forward Thrust projects approved at the Special Election of March 1968, greatly accelerated the trend.

More than twenty private engineering consulting firms participated with the Department's own engineers in expediting design work on: storm water separation projects in Ballard, Magnolia, University, Central Area, Beacon Hill and West Seattle; and on arterial street improvements including S. W. Roxbury Street and Olson Place, 15th Avenue N.W., West Marginal Way S.W., Meridian Avenue N. and Aurora Avenue N.

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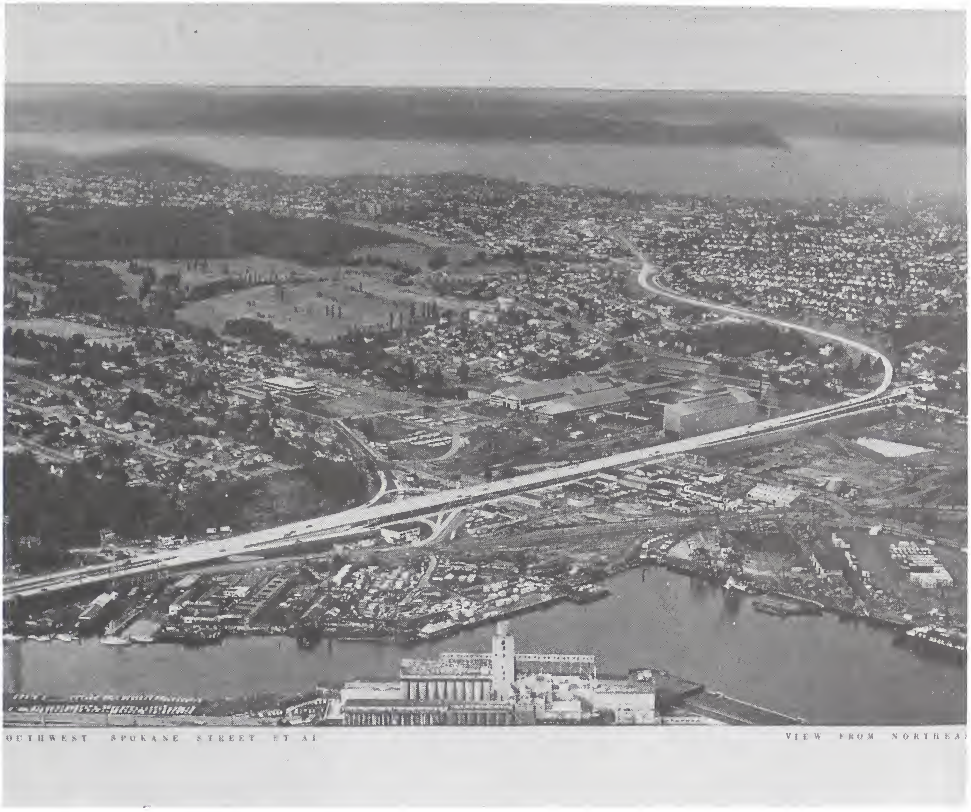
[32] This was established in 1956.

By the late 1960s Spokane Street had achieved the dubious distinction of being Washington State's second most heavily travelled roadway, with an average daily traffic of 75,000 vehicles. The completion in 1944 of the viaduct between the East Waterway of Harbor Island and Airport Way had provided an "express" route between these two points which avoided the tangle of street crossings, traffic signals and railroad tracks that cluttered up the lower roadway; in 1959 the link with the Alaskan Way Viaduct extension provided several additional miles of grade separated driving and stimulated a further increase in auto traffic. Included in the 1960 Capital Improvement Bond Issue was a provision for some $6,000,000 for the construction of a structure on S.W. Spokane Street, part on the West Seattle Freeway extending from the S.W. Spokane Street Bascule Bridge at West Marginal Way westerly to a connection with Harbor Avenue and Admiral Way, and thence southerly to the surface connection with 35th Avenue S.W. and Fauntleroy Way S.W. Contracts, with a consulting engineering firm and with architectural consultants to develop the design and prepare the construction plans, were entered into. The consultant's plans were advertised for bids in February 1963, with a bid received totalling $6,400,000. The engineer's estimate of cost for the contract was $4,032,000, putting the low bidder 37% above the estimate. The bid was rejected by the Board of Public Works on the recommendation of the City Engineer.

A review of the plans by the Engineering Department resulted in a recommendation by the City Engineer that the Engineering Department's own engineers take over the job of preparing new design and construction plans for the work. The City Council approved this arrangement, and appropriated $150,000 from the Bond Issue monies to do the job. The work was completed in the time estimated by the Department, and in early 1963 new bids were requested, resulting in a low bid of $3,845,000 which was well within the estimate and monies available for the construction. Although the job completion date was set back six months due to the redesign, there was actually an overall saving of some $2,500,000.

Another significant fact relating to the redesign was the first major use of the critical path method of setting up a time schedule and estimating the cost of the work and the man-hours entailed in accomplishing it. This was accomplished through the assistance of the Management Engineer's office, which had then been just recently established.

While the completion of the elevated roadway between the West Waterway and West Seattle greatly increased the traffic-carrying capacity of that portion of Spokane Street, the portion between the Alaskan Way Viaduct and the Bascule Bridge, with its numerous street intersections and railroad grade crossings, remained a major bottleneck. On January 6, 1967,



Looking Southwest at West Seattle Freeway Completed April 19, 1965

in response to a petition from residents of West Seattle urging it to take immediate steps toward completion of the elevated roadway between the Alaskan Way Viaduct and the Waterway, the City engaged the engineering firm of Howard, Needles, Tammen and Bergendorff to establish the best route for a connection between West Seattle and the Seattle arterial network. The consulting firm, with an eye toward minimizing disruption and dislocation in the adjacent neighborhood, recommended the existing Spokane Street corridor in the preliminary reconnaissance report which it issued in 1968. Actual design was started early in 1970 by Seattle Urban Design Associates, a joint venture of the engineering firm previously mentioned and Erickson-Massey, urban designers and planners. In September 1971 this firm issued its final design report and technical supplement; on February 25, 1972, location and design hearings were held before the City Council. Coming hard on the heels of the Bay Freeway and R. H. Thomson controversies, with their lingering residue of divisive bitterness, the West Seattle Freeway hearing was expected to stimulate considerable opposition; this, however, did not materialize. Part of the reason was undoubtedly the nature of the proposed facility itself; an extension and improvement of an existing corridor rather than a new one, it had few of the controversial features of the Bay Freeway or R. H. Thomson; it involved no massive displacement of residents or disruption of existing neighborhoods; and inasmuch as it was to run primarily through an industrial district, its environmental impact was expected to be minimal.

The key elements in the finally adopted plan were to be twin, four-lane high-level bridges over the Duwamish River which would provide uninterrupted flow of automobile and truck traffic, as well as marine ship and barge movements. Each bridge was to have an exclusive transit lane.

Following City Council approval a referendum succeeded in putting the entire question of the bridges and freeway connections up to a city-wide vote on March 16, 1974. 68% of the voters approved the $37 million first phase, so final plans and specifications were prepared. However, bids on June 26, 1974, exceeded estimated costs by more than 60%. This was a major setback, and as of 1975 no source of added funds has been made available.

Since 1917, when it was first established, the Professional and Technical Engineer's Association (formerly Technical Engineers and Architects' Association) of the American Federation of Labor (now AFL CIO) has been the principal representative of Engineering Department employees in their parleying with the City Council concerning wages and working conditions. Until 1967 this Union had not the legal or economic power to back up its demands, and could only serve as an informal representative and bargaining body insofar as the rights of employees *vis a vis* the City Government were concerned. The 1967 Legislative Session enacted a law obliging Municipal and County Governments to bargain collectively with such unions as the employees might choose, according to prescribed elective and certification procedures, to represent them. This, of course, radically altered labor management relations as they had previously existed, and placed them on approximately the same footing as those between the management and work force of a private corporation. As a result, the P&TEA, under the guidance of a new and unusually energetic business manager, conducted a highly successful organizational drive among employees of the department, with the result that on September 16, 1968 it handily won a collective bargaining election and established itself as the exclusive legal bargaining agent for the Engineering Department. In doing so, it had to overcome intense and deeply-rooted opposition from many employees who felt that the "professional" status of engineers, particularly those in the upper echelons, would be downgraded and put in jeopardy by unionization. The opposite view prevailed, however, and the Department was divided, for bargaining purposes, into three units, representing technical, professional and supervisory categories.[33] Though this arrangement fell far short of satisfying everyone, it was the best acceptable compromise; and, having thus obtained its bargaining agent status, the union was able to conclude satisfactory wage negotiations through the year 1971.

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[33] Although no actual bargaining unit has ever been set up for supervisors.

Maintenance and shop buildings in the Engineering Department's far flung properties continued to claim their share of attention during the 1960s. On March 3, 1966, plans for refurbishing the original concrete building at 705 Charles Street were completed by a consultant; the Mayor's Office, however, decided against proceeding with this project, and as of this writing plans are underway for a new building. On February 21, 1961 a $400,000 program for the modernization of the Department's shops at Fremont was first proposed; nothing came of this, however, and six years later a refuse transfer station was constructed on the site, the shop activities that had been formerly carried on there being transferred to Haller Lake and Charles St. The project involved demolition of one more Seattle landmark, concerning which the *Outlook,* in its issue of May 4, 1967, gave the following historical summary:

"OLD LANDMARK TORN DOWN TO MAKE WAY FOR REFUSE STATION

"The old box-type wooden building housing the Fremont Engineering Shops, built by the City of Seattle at Interlake N. and North 34th, has been torn down, and site is being cleared for the construction of the North End refuse transfer station.

"First known as the Edgewater Stables, it was built in 1915 as a stable for horses used to pull city equipment. The upper floors were used to store spare parts, tools, and water meters.

"The Edgewater Stables were first used primarily by the Water Department and the Streets and Sewers Department serving the area. The heavy equipment used to maintain the streets, sewers, and water mains was stored in large sheds adjoining the stable. City Inspectors used a horse and buggy to visit job sites.

"Horses gradually were replaced with Model "T" Fords and other motorized equipment. By 1930, the stable was converted to shop use. . . The stable was remodeled and the building became known as the Fremont Engineering Shops.

"Last fall the Fremont Maintenance District Headquarters moved to the Engineering Department Shops at Haller Lake. Two weeks ago, the Traffic Engineering Shop moved to Eighth S. and S. Charles.

"As the Fremont Engineering Shop was being torn down, an old newspaper dated October 1, 1916 was found in the walls. The headline stated "Uniformity in Traffic Laws Urged." The article stated "The slow crawl of street traffic of 20 years ago has given place to the mad rush of traffic today. That traffic is becoming more and more fraught with danger . . . danger not only to pedestrians on the street, but as well to those who themselves form a part of such vehicular traffic. These conditions imperatively demand that those who do the thinking for users of our highways bend every effort toward a satisfactory solution of the traffic problems"."

Sounds familiar, doesn't it?

The preceding narrative, and the accompanying illustrative material, have attempted to chronicle the growth, development and achievements of the Seattle Engineering Department from its rather inchoate beginnings up to the present. It cannot, of course, pretend to have uttered the final word either as a history of public works in Seattle, or as a narrative of the evolution of the subdivision of the Municipal Government which planned and directed these projects; its aim, rather, has been the somewhat more modest one of giving a general account of the engineering enterprises that so radically altered the geographic and socio-economic face of Seattle and the surrounding area, and, by implication, of hinting at some possible directions that future developments may take. That future is, to be sure, a vague, challenging, uncertain and problematical one. The decade of the 60's in Seattle, as elsewhere in the nation, was marked with a series of disappointments, reverses and cumulative traumas, with new and unprecedented problems seeming to have developed faster than the resources and techniques available for solving them. The approaches and formulations that seemed to work satisfactorily in the past daily become more and more inadequate to meet the challenges of the present.

Considerations of this kind have already brought about the demise of one major planned expressway in Seattle; and as this is written, has put the fate of the final link of Interstate 90 in the balance. The freeway vs. rapid transit issue has at times polarized both the engineering world and the Municipal Establishment; and even on the relative emphasis to be given to private automobiles and transit busses on freeways there are lines of ideological and political cleavage. Although the strategy of building more and more facilities for the movement and storage of automobiles has long since been shown to offer no real solution to the urban transportation problem, such alternatives as rail rapid transit (twice voted down in Seattle) and diesel buses on freeways, as well as any number of experimental schemes, have all fallen short in one way or another, of offering final or permanent solutions to congestion and pollution problems that show signs of rising to critical proportions.

The transportation impasse is only one of the continuing problems requiring close collaboration between the Mayor, the Council, Departments of Community Development, Lighting and Engineering. Rebuilding or restoring blighted, or allegedly blighted, areas (as in the long controversy over the Pike Place Public Market) , dispersion vs. centralization; even such once more or less routine questions as underground wiring or refuse disposal have become the centers of intense and bitter controversy during recent years, as these supposedly cut and dried matters have been found to have far-reaching social, economic and environmental implications not dreamed of in earlier days. Municipal engineers are finding it increasingly necessary to become part-time ecologists and sociologists; to give increasing thought to the remote, wide-ranging implications of their work as it affects the environmental quality and social structures of the communities.

Can such new and unprecedented challenges be met? It would take a bold or a rash prophet to attempt to answer now; but one can take at least a modicum of hope from the record of monumental and seemingly insolvable problems successfully overcome in the past. Seattle's history has, in fact, been very largely a record of achieving the "impossible." It brashly undertook earth moving projects of a scope and complexity never previously attempted, and openly derided by the experts of their day; it developed long range plans for water supply and sewage disposal that were in many re-

City Engineers

Paul A. Wiatrak	May 1974—
Robert J. Gulino	May 1971—May 1974
Roy W. Morse	Feb. 1957—May 1971
William F. Parker	Feb. 1953—Jan. 1957
Ralph W. Finke	May 1948—Dec. 1952

Framed picture is a montage of all City Engineers from Albro Gardner to Robert Gulino.

spects years ahead of their times; it gained, at a comparatively early period of its history as a metropolis, the reputation of being the best lighted City in the nation; it developed large scale electrical supply plans that proved adequate for decades. Such accomplishments, even if they cannot provide guidelines and precedents for the future, do at least show that Seattle and its officials and employees have faced and solved monumental problems in the past. They can again.

TABLE I
TOTAL MILEAGE OF STREET SURFACES

Annual Report Summaries	Sidewalking	Grading and Regrading	Paving	Planking	Population
1900	—	—	—	—	80,671
Previous to 1902	—	—	23.96	13.95	
1907	528.14	318.09	63.01	64.54	
1910	841.27	527.60	140.78	104.09	237,194
1915	1,050.95	688.10	242.29	141.43	
1920	1,197.12	751.90	324.36	153.68	315,312
1925	1,348.56	834.84	507.97	0.39	
1930	1,354.44	984.01	736.09	1.29	365,583
1935	1,391.97	1,012.62	769.09	0.50	
1940	1,703.88	1,059.09	789.87*	0.17**	368.302
1945	1,470.17	1,071.04	810.67	0.09	
1950	1,596.36	1,097.26	889.50	—	467,591
1955	1,746.91	1,163.00	971.95	0.05	
1960	1,802.68	1,188.33***	1,022.80#	1.56	557,087
1965	1,855.52	1,217.11	1,082.16	1.39+	

Each year's figures are cumultive up to and including that year

+ Foot bridges	0.16
Plank decks	0.37
Concrete decks	0.86

* Resurfacing program introduced.

** Wooden trestles included from here.

*** Wood and concrete bulkheads included from here.

# Asphalt and concrete surfaces combined from here

See next page for breakdown of street surfaces.

TABLE 11
EXTENT OF VARIOUS STREET SURFACES USED IN SEATTLE

Year	Asphaltic Concrete	Asphalt	Asphalt Top	Brick	Wood Block	Mac-adam	Sand-stone	Portlant Cement Concrete	Granite	TOTAL
1930	7.27	181.09	9.54	66.05	1.62	—	15.68	457.68	3.01	736.09#
1935	7.66	179.24	9.58	64.51	1.22	—	15.68	488.19	3.01	769.09
1940	16.21	173.89	6.47	61.89	0.84	—	14.96	513.01	2.60	789.87
1945	55.99	158.24	6.47	36.99	0.79	—	11.77	537.87	2.55	810.67
1950	176.00	88.47	—	0.90	0.00	—	10.78	613.35	—	889.50
1955	252.97	34.83	—	0.79	—	—	7.96	675.40	—	971.95
1960	278.13	29.61	—	0.79	—	—	7.21	707.06	—	1,022.80
1965	318.41	23.14	X	X	X	X	X	734.26	X	1,082.16

X — all other types 6.35

Includes 0.15 mile concrete top

CHRONOLOGICAL LIST OF MAYORS AND CITY ENGINEERS-1875 to 1975

Mayor	From	To	City Engineer (Surveyor until 1890)
ONE YEAR TERM		1865	H. J. Stevenson
Henry L. Yesler	8–2–74	8–2–75	W. B. Hall—1875
Bailey Gatzert	8–2–75	7–31–76	R. L. Thorne
Dr. Gideon A. Weed	7–31–76	7–29–78	P. G. Eastwick
Beriah Brown	7–29–78	8–3–79	M. J. Costello
Orange Jacobs	8–3–79	8–2–80	F. H. Whitworth
L. P. Smith	8–2–80	7–31–82	
Henry G. Struve	7–31–82	8–3–84	Joseph M. Snow—1883
John Leary	8–3–84	8–3–85	Reginald H. Thomson
Henry L. Yesler	8–3–85	8–2–86	
William H. Shoudy	8–2–86	8–1–87	Albro Gardner
Thomas T. Minor	8–1–87	7–30–88	
Robert Moran	7–30–88	8–3–90	John G. Scurry M. Stixrud
Harry White Short term, prior to adoption of new charter.	8–3–90	10–1–90	
TWO YEAR TERMS			
Harry W. White	10–14–90	11–30–91 Resigned	Albro Gardner—11–24–90/5–92 First City Engineer
George W. Hall	12–9–91	5–21–92	Reginald H. Thomson May 25, 1892—1911—in Feb. 1894 Mr. Thomson was removed. Mayor Ronald removed two members of Board of Public Works and Thomson was reinstated.
James T. Ronald	3–21–92	3–19–94	
Byron Phelps	3–19–94	3–16–96	
Frank D. Black	3–16–96	4–6–96 Resigned. He couldn't maintain his standards.	
W. D. Wood	4–6–96	11–19–97	
Thomas D. Humes	11–19–97	3–21–98	
A Dr. J. E. Crichton served as acting mayor in this period. The record is not too clear.	3–21–98	3–21–04	
Richard A. Ballinger	3–21–04	3–19–06	
Wm. Hickman Moore	3–19–06	3–16–08	
John F. Miller	3–16–08	3–21–10	
Hiram C. Gill	3–21–10	2–7–11 Recalled	R. H. Thomson retired because of ill health and A. H. Dimock finished his term.
George F. Cotterill	3–18–12	3–16–14	Arthur H. Dimock 12–11–11 to 7–31–22
Hiram C. Gill	3–16–14	3–18–18	

Mayor	From	To	City Engineer
Ole Hanson	3–18–18	8–28–19 Retired ostensibly for health reasons.	
C. B. Fitzgerald	8–28–19	3–15–20 Appointed by Council to serve out Hanson's term.	
Hugh Caldwell	3–15–20	6–5–22	
Robert D. Hesketh, acting while Caldwell was absent on trip to Orient	1–14–22	3–10–22	
Edwin J. Brown	6–5–22	6–7–26	James D. Blackwell 7–31–22 to 1–6–27
Bertha K. Landes	6–7–26	6–4–28	William Chester Morse—1–6–27 Took office 2–1–27
Frank E. Edwards Recalled following dismissal of J. D. Ross, Supt. of City Light	6–4–28	7–13–31	William D. Barkhuff 6–25–28 to 7–26–30 R. H. Thomson 8–18–30 to 7–31 Appointed to complete term of Barkhuff, deceased.
Robert H. Harlin	7–14–31	6–6–32	Daniel W. McMorris 7–16–31 to 1932
John F. Dore	6–6–32	6–4–34	Melvin O. Syliaasen 7–19–32 to 6–34
Charles L. Smith	6–4–34	6–1–36	Thomas R. Beeman 8–20–34 to 6–1–36 Oscar A. Piper served as acting City Engineer for two short periods while appointees were being certified. Nathaniel A. Carle 6–22–36 to 3–3–38
John F. Dore	6–1–36	4–13–38 Relieved by Council 4–13–38 Died 4–13–38	
James Scavotto, Acting	3–20–38	4–26–38	
Arthur B. Langlie Took office ahead of time because of death of Mayor Dore. Resigned to take office of Governor.	4–27–38	1–11–41	Charles L. Wartelle 5–3–38 to 12–31–47 Asked to be relieved because of ill health.
John E. Carroll	1–27–41	3–27–41	
Earl Millikin	3–27–41	6–1–42	

Mayor	From	To	City Engineer (Surveyor until 1890)
William F. Devin Charter provision of 1946 providing for 4-year term became effective in 1948.	6–1–42	6–1–52	C. G. Will, Acting. James Robertson, Acting.
			Term of engineers also became 4 years Ralph W. Finke 5–3–48 to 12–1–52 R. R. Hubbard, Acting 12–1–52 to 2–2–53
Allan Pomeroy	6–1–52	6–56	William F. Parker—Appointed 12–24–52 but took office 2–2–53 owing to Navy commitment. Stayed until 2–1–57 when R. W. Morse assumed duties.
Gordon S. Clinton	6–56	4–64	Roy W. Morse—Appointed 1–1–57 Assumed duties 2–1–57 Reappointed December 1964, Dec. 1968.
J. D. Braman Resigned to take position with Department of Transportation	4–64	3–69	
Floyd Miller Appointed by Council to serve out Mr. Braman's term	3–69	1–70	
Wes C. Uhlman	1–70	Reelected 1–74	Mr. Morse retired 4–71. Robert J. Gulino assumed duties May 25, 1971. Paul A. Wiatrak appointed May 1, 1974.

CHAPTER 19

Board of Public Works

THE Freeholders' City Charter, adopted October 1, 1890, created a Board of Public Works consisting of three "electors and freeholders," who "shall receive such compensation as the city council may by ordinance provide."

The Board was authorized and empowered to:

> have the management, control, design, and construction of all public works;
> appoint "the following subordinate officers who shall have such powers as the Board may provide";
> - a superintendent of water works,
> - a superintendent of sewers,
> - a superintendent of buildings, bridges and wharves,
> - a street commissioner,
> - a city engineer;
>
> publicly open and read bids on all public improvements to be made by contract, determine the lowest bidder, award the contract, and administer the contractor's performance.

Revised Ordinances of the City, 1893, list the following:

1890–91–92 Board of Public Works
Commissioners: Jesse Cochran,
George H. Heilbron,
W. V. Rinehart
Secretary: F. W. D. Holbrook,
J. F. Pratt,
F. W. Wald (short term)

City Engineer: Albro Gardner
Superintendent of Water Works: W. T. Chalk
F. W. D. Wald
Street Commissioner: G. N. Alexander
Superintendent of Buildings: L. F. Compton

Minutes of the Board in the early 1890s provide a picture of the early development of the City of Seattle. Some of the matters which came to the Board of Public Works' attention in 1894 clearly are indicative of the times, but, everything being relative, early Board members faced some of the same kinds of problems as the present Board members do, differing only from the mode of living and elements inherent to each era.

Entries show the sale of an old wooden Engineering Department one-horse wagon for $5.00; a water pipe installation on Jefferson Street from 5th to 6th, with an appropriation of funds in the amount of $48.95; repairs made to the Old City Hall Building with $50.000 appropriated to pay for the work and materials. Historic names are mentioned throughout the minutes reflecting the first settlers and history of Old Seattle.

Expenses for running the Board of Public Works Department during that period averaged $600 per month and included salaries for the Board Chairman, two members, Secretary, Stable Boss, Blacksmith, and Blacksmith's helper. Expenses included $5.00 for stationery, $2.00 for postage, feed, water, stable rent and care of one horse and buggy.

One bid was received for replanking Jackson, South 6th, King and South 7th, but it was rejected because the proposal page was not signed. That occasionally happens in present times.

On March 3, 1896 the voters approved a new Charter. Among the many changes included, the Board of Public Works was reconstituted to consist of department heads; each of whom "shall be appointed by the mayor, by and with the advice and consent of the city council, for the term of . . . three years";

a city engineer,
a superintendent of streets, sewers and parks,
a superintendent of buildings,
a superintendent of lighting and water works.

"The members of the board, as such, shall receive no compensation.

Each board member was to manage and control his department, "subject to the direction or control of the Board of Public Works."

The Board was "authorized and empowered, and it is hereby its duty, to take charge of, manage, control, design and construct" the water and light and power systems, public buildings, wharves, docks, bridges, viaducts, streets, sewers, public places and grounds, and public utilities in streets (in other words, all public works).

> On "all public improvements to be made by contract . . . bids shall be publicly opened and read . . . The Board shall proceed to determine the lowest bidder and may let the contract to such bidder . . . ," and shall supervise the performance of the successful bidder.

Thus, the 1896 Charter called for a Board of Public Works that would insulate the contract award process from political pressures while retaining to the Mayor and City Council their traditional roles of policy decision-making. Experience over the years demonstrated that such an arrangement did successfully remove public contracts from political persuasion and afforded protection to the elected officials, individual Department heads and the City by having a non-partial group publicly receive bids for public improvements and award and direct the administration of public works contracts. The Board consistently provided strong guidance in public works activities and management of the public streets.

Fifty years later, on March 12, 1946, after many months of painstaking freeholders' effort, a new Charter was submitted to the voters and approved.

The 1946 freeholders retained the Board of Public Works in the new Charter, with essentially the same responsibilities and authority as had earlier been written into the 1896 Charter.

Since 1946 no amendments to the Charter have been made affecting the Board of Public Works other than the addition, in 1969, of the Superintendent of Parks and Recreation.

Board members are appointed by the Mayor to alternating four-year terms, to assure continuity of activities, subject to City Council confirmation, and subject to removal for cause.

The Executive Secretary is appointed by the Board, subject to Civil Service, and implements the directions of the Board.

Since its earliest days, the Board of Public Works has considered one of its major activities in protection of the public interest to be the opening of bids, the awarding of contracts, and the supervision of contractor performance.

While very early figures are not available, the following do tend to illustrate the importance of these activities:

	1950	*1975*	*Increase*
Number of contracts	89	127	43%
Total Amount Contracts	$7,856,317	$25,670,276	227%

During this period, 1950 to 1975, one of the smallest projects was for furnishing and installing an electrical trolley duct system in 1953 in the City Light Building at a contract price of $693.00, while the largest project during that same period was the 1964 contract for the Boundry Dam Power Plant and Appurtenant Works for $29,731,220.48.

BOARD OR PUBLIC WORKS

	CHAIRMAN OF THE BOARD	*Yrs.*	*EXECUTIVE SECRETARY*	*Yrs.*
1894	A. Jackson	1	George F. Meacham	3
1895	E. Alexander	1		
1896	J. W. Van Brocklin	1		
1896–1899	R. H. Thomson	3	C. B. Bagley/Frank Oleson	1
1900	F. N. Little/R. H. Thomson	1	C. B. Bagley	32
1900–1908	L. B. Youngs/R. H. Thomson	7		
1908	A. V. Bouillon	1		
1909–1911	R. H. Thomson	2		
1911–1912	A. L. Valentine	1		
1912–1923	L. B. Youngs	11		
1923–1925	George F. Russell	3		
1926–1927	L. Murray Grant	2		
1928	G. W. Roberge	1		
1929	G. W. Roberge/G. B. Avery	1	C. B. Bagley/G. W. Roberge	1
1930	G. B. Avery	1	G. W. Roberge	18
1931	G. B. Avery/J. D. Ross	1		
1932	J. D. Ross	1		
1932–1934	H. W. Ross	2		
1934–1936	Dudley B. Eddy	2		
1937–1938	N. A. Carle	2		
1938	G. B. Schunke	2 mos.		
1938–1949	W. C. Morse	11	G. W. Roberge/E. G. Henry	(1947)
1950–1953	E. R. Hoffman	4	E. G. Henry	23
1954–1956	W. E. Parker	3		
1957–1971	Roy W. Morse	14		
1971–1972	Kenneth M. Lowthian	2	Betty L. McFarlane	5
1973	Alfred Petty	1		
1974	R. J. Gulino	5 mos.		
1974	Gordon Vickery	7 mos.		
1975	David L. Towne	1		

CHAPTER 20

Reclaiming Green Lake

GREEN Lake is a pool remaining from a glacial drainage system that followed the withdrawal of the Vashon ice sheet some 30,000 years ago, and during the intervening years its depth and contour have changed. One of the modern disturbances affecting the Lake has been the apparent proliferation of algae growth and its attendant problems.

According to the 1960 survey by the University of Washington Civil Engineering Department, the Lake was actually named for the green algae that grew so luxuriantly on its surface, along with several other kinds of aquatic growth that thrive there and furnish food for the fish.

In primitive times the algal blooms were a natural occurrence. Clearing of the timber from the shores of the lake may have had an effect on the drainage which helped supply the lake with water. Since recreation activities have become of more importance, the algal blooms are a greater concern. Civilization has upset the natural balance of the lake and its jewel-like quality has largely vanished.

The Lake was originally fed by springs. As the City grew, these were picked up by drainage lines and carried into the sewer system. The Lake was lowered about seven feet in 1911 when the North Trunk Sewer was completed and the swampy areas left on the edges were diked off and filled by dredgings from the lake bottom and with material from the Woodland Park leveling. A portion of the old dike may still be seen when the water is low.

When signs of deterioration became evident in the Lake, means were sought to restore the supply of fresh water and in 1920 the Licton Springs flow was disconnected from the waste lines and returned to the Lake to supply part of the fresh water needed. However, since this flowed as a creek through an area served by septic tanks, it was soon diverted back to the sewer system. Overflow from the City's Maple Leaf and Green Lake reservoirs, which had been built in 1910, was meanwhile channelled into the Lake.

Needless to say there has been much newspaper comment and public controversy through all the years, especially since 1916. In 1936 and 1937 Green Lake's use as a bathing beach was considered unhealthful and its patronage decreased considerably from a previously estimated 150,000. Nutrients in the lake and water temperature created conditions which caused the algae crop that season to bloom prolifically. Studies made early in 1936 resulted in a control project by the W.P.A. Dredges were set up and outlets established through the North Trunk Sewer. The various types of algae were identified by University of Washington scientists and their distribution was determined by the crew on the Lake. The algae appeared to thrive in the areas where the water vegetation grew best and these were also the retreats of the numerous water fowl.

Copper sulphate was chosen as the best agent to destroy the algae with the least harm to fish and with no apparent harm to bathers. Proper dosage was a matter for experimentation. A 4.5-pound application per million gallons of water, applied by blowers, mounted on an outboard-motor-powered scow, was decided upon. The blowers were controlled by varying the speed at which they operated, and wind currents and velocity had to be considered. The spraying was started on July 22, 1936, while the algae was in full bloom and highly objectionable. The scow, moving in evenly marked lanes, treated the lake in five days. On the third day it was noticed that in the area first treated, the scum was disappearing and three days after the treatment was completed the lake was clear in its shallower depths. Fewer fish than had been expected were killed in the operation.

About the middle of June, 1937, the algae again bloomed excessively and indicated another bad year, so the treatment was repeated. Some improvements were made as the result of the first experience: for instance, water depth was included in calculations determining the amount of copper sulphate. The quantity was again 4.5 pounds per million gallons of water over the entire Lake surface. The dusting program began July 26; and a total of 33 working hours was required for the program.

There was no further trouble with algae during the summer except in the weed beds which were again treated on August 18, and the Lake water continued to clear as the algae died and sank to the bottom. Dredges removed approximately a million gallons of sludge and discharged it through the sewer system to the outfall at West Point.

The 1960 study by the University of Washington team under Professor Robert O. Sylvester indicated that Green Lake water compared favorably with U. S. Public Health Service drinking water standards and chlorination would have made it satisfactory for such use during the study period in 1959. No constituents in the water were found to be harmful to the fish population. Bathers have little effect on water quality, but there is a relation between the waterfowl and the bacterial quality. The study which resulted in the 1960 report was instituted as a result of the unpleasant conditions in the Lake and by the increasing number of people who used the Lake and its facilities. The effects of the sewage discharge following the Ravenna sewer break in 1957 had long since been eliminated.

If sufficient fresh water containing no plant nutrients could be supplied to the Lake, the algae bloom could be balanced to the requirements of the fish life and its unpleasant consequences thus controlled. The Lake has the capacity to support a greater fish population, and fishing and swimming are its two greatest recreational uses.

The University study was quite comprehensive and some of its conclusions were that the balance between the organisms in the Lake must be better maintained; that waterfowl, especially the ducks, may be more detrimental than desirable because of their being the intermediate hosts for the larvae which causes the swimmers itch and which is developed in the snails that are eaten by the ducks; that the intake for the fresh water from the City's reservoirs should enter the Lake on the southerly shore which is the direction from which most of the winds flow, thus giving it the greatest opportunity to intermingle with the Lake water before it is ultimately discharged through outlets in the northeasterly area into the North Trunk Sewer; that Green Lake is unequalled by any other lake in the county for its recreational advantages and there can be no monetary value attached to its resources. The study showed that the Lake has been in its present state for some 6000 years, and that the annual algal disturbance is no new happening—it has been a regular occurrence during the past several thousand years. Wind currents are responsible for the only circulation of the water in the Lake and are sufficient to keep the water from stratifying.

In 1962 another program of deep dredging and weed removal added many years to the life of the Lake. Continuous use of copper sulphate was not recommended as it might develop a cumulative effect harmful to the fish life. Fresh water in sufficient quantities to counteract the effect of evaporation in the summer months is a requisite. A chlorination plant operates at the West Beach during the swimming season. Several major water supply points utilizing overflow water from the Green Lake and Maple Leaf Reservoirs have been installed by the Water Department and these help to overcome the effects of summer evaporation. Shore side dikes have been repaired or installed along much of the Lake and sand has been spread over some of the newly dredged areas. Storm water drainage still enters the lake during periods of heavy rainfall, but overflow outlets come into operation automatically when the height of the Lake reaches an elevation of 156.5.

The continuous supply of fresh water appears to be the most practical way to keep the phosphate level low enough to reduce the algal pulses that develop whenever all the conditions are propitious.

CHAPTER 21

Century 21 Exposition The Jewel Box Fair Epilogue

IN the early days of our City, Henry Yesler's cookhouse served as the Community Center. The Seattle Fire of 1889 wiped out the wooden building business district and the reconstruction that immediately began introduced the age of brick, stone and concrete. The gold rush of the 1890s brought increased trade, shipping and improved transportation and helped to push the town into the twentieth century. People began thinking in terms of being the gateway to Alaska; it was a town with a lusty, ebullient spirit, and got away with announcing itself as the capital of the new gold producing territory. That statement led to commemorating the tenth anniversary of the first shipload of gold with a celebration, planned for 1907, but actually opened in 1909. They celebrated not only Alaska and the Yukon but included British Columbia, California, Japan, Oregon, China and the Philippines—all the Pacific Rim countries. That fair, known as the Alaska-Yukon and Pacific, or A.Y.P. was developed on the newly acquired University of Washington Campus, at the urging of Professor Edmond Meany who was thinking of the landscaping and buildings that would accrue to the University. The grounds were laid out by the Olmsted brothers of park and fair grounds fame. Many of the buildings did become integral units of the University plant. Through the years most have been replaced by permanent facilities designed for current academic needs.

That was a good beginning for a new frontier town which had been growing and continued to double its population every ten years or so. The stimulating environment and indomitable pioneer spirit was still there and finally prompted a suggestion to mark the 50th anniversary of the A.Y.P. with another fair. After many conversations and meetings, it came out that fairs needed a sponsor, and the challenge was picked up by City Councilman Al Rochester, who sponsored the essential Council legislation whereby the City requested State authorization for a fair. The fair was off and rolling—an auspicious start.

But from January 31, 1955, there were problems and difficulties galore before the Fair became a reality in 1962. It involved State, Federal, and local governments, the Bureau of International Expositions, the State of Washington World's Fair Commission, Seattle's Civic Center Advisory Committee, Century 21 Corporation, Allied Arts of Seattle, Chamber of Commerce, and all City Departments. Governor Arthur B. Langlie appointed Eddie Carlson chairman of the State World's Fair Commission, and Mayor Gordon S. Clinton appointed Harold S. Shefelman chairman of the Civic Center Advisory Committee. With Joseph E. Gandy as President of the Century 21 Corporation and with Ewen C. Dingwall as Manager, progress was made. The U.S. Secretary of Commerce appointed a special U. S. Commissioner, Dr. Athelstan Spilhaus, for Century 21 liaison. Other committees and sub-committees and many prominent civic leaders were involved.

Investigation showed that a successful fair had been staged in England on a 28-acre site. From early visions of a vast landscaped area, the survey ended with the acceptance of the Civic Auditorium property which the City already owned, and the idea of the 78-acre Jewel Box Fair emerged.

Travelers to Europe brought the idea for the Space Needle and its revolving restaurant. Site location proved elusive till City Engineer Morse and his people determined that a City-owned tract in the Fair area could be made available. John Graham, architect, completed the design while construction, using private financing, was actually progressing.

The stodgy old Civic Auditorium had possibilities for Minoru Yamasaki, who saw within its walls the Opera House and theaters that would be. The delicate and beautiful United States Science Pavillion, product of Yamasaki's fertile mind, was destined to become the home of the Pacific Science Center. Architect Paul Thiry designed the dramatic Coliseum for the State of Washington to house major exhibits during the Fair, and for continuing use after the Fair as an exhibition and sports center.

All the permanent buildings were built by private contractors and became property of the City. Buildings put up for rental to exhibitors were planned so that they could be made suitable for further use with a minimum of remodeling. Temporary structures built for exhibitors were removed at the Fair's termination, so that the long dreamed of and much talked about Civic Center could be expanded and completed around the beautiful, permanent structures.

Mr. Bogue who gave us a first plan for a Civic Center in 1911 would be pleased with our efforts for he made this reference 'way back then: "It is the wisest insurance a big city can make to spend money in the development and improvement of the citizen's environment. In the past property owners seem to have thought that parsimony meant economy. Therefore they narrowed streets and contracted spaces and looked upon a beautiful vista as the eighth deadly sin. If planning is neglected at the beginning, or badly done, through timidity or lack of imagination, it places a burden upon progress for fifty or a hundred years which is paid for seven or eight times over for the lack of prescience and daring." He might remind us that we waited almost too long.

Bond issues were approved by the voters. Appropriations were made by Federal, State and City Council, but before that money was available, several hundred people advanced funds to cover early expenses.

Tree-lined avenues on the streets leading to the Fair Grounds were proposed by Mrs. Charles (Betsy) Frisbie. These became the inspiration that has led to the extended tree planting program which the City is following to enhance its thoroughfares.

The Fair began at the appointed day and hour. President John F. Kennedy pressed the same nugget-set telegraph key that had been used by President Taft in 1909 to signal the start of the A.Y.P. Exposition, but the signal for Century 21 did not come by simple wireless but by a computer and a star and a celestial vibration, to emphasize the importance of science in our time. Century 21 was an Arts and Science Fair, and science drew the big crowds. When the tickets were counted, the Science Center outdrew Show Street three to two. It had the longest waiting lines, and more repeat visitors than the next five most popular exhibits together.

The consultants had predicted attendance of around 9,250,000—they really couldn't believe 10,000,000 would come. But at the close of the last day 9,609,969 people had paid admissions and passed through the gates.

The fair ended with a profit and no debts, and the City has a beautiful bonus that draws even larger crowds than did the exposition on its biggest day.

Alastair Cooke ended his approval of the Science Center with ". . . It is as if Venice had just been rebuilt."

(Much of the foregoing information from the book,
"Century 21," by Murray Morgan.)

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